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LASALLE EXTENSION UNIVERSITY

BUSINESS PSYCHOLOGY

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PREFACE

The understanding of psychology is one of the most important roads to success for the modern business man. Industrial and commercial work are in thousand-fold contact with the mental life. Salesmanship and advertising, learning and training for technical labor, choosing the right position and selecting the right employe, greatest efficiency at work and avoidance of fatigue, treatment of customers and of partners, securing the most favorable conditions for work and adapting the work to one's liking, and ever so many other problems stand today before the business world and cannot be answered but by psychology.

To reach such an understanding it is not necessary that the business man enter into the depths of all those dark questions over which the scientific psychologists are wrangling. The scholarly volumes on psychology written for specialists certainly contain much which would be of no importance for the practical man. It is the aim of this volume on business psychology to bring together those results of modern psychological thinking which are significant for the work of the business man. Yet business psychology too is, after all, psychology, that is, a science which needs serious and penetrating study. No one ought to believe that a science can be mastered in any other way than by serious study.

Such a study involves, first of all, the laying of solid foundations. We must therefore plod through much material which seems at a superficial glance unimportant

for a business man. The first half of the volume hardly speaks of buying and selling and advertising and selecting workers. It is devoted to a careful treatment of perceptions and memories and feelings, but this apparently unpractical study is needed if the later practical discussions are not to hang in the air.

Above all, the volume speaks throughout the serious language of science. Those who fancy that business affairs ought to be treated in the snappy way of the popular business literature will feel and ought to feel disappointed. Such gingery talks about business as are usually offered to business men are very entertaining and amusing and sometimes stimulating, but they are entirely unfit to convey that thorough understanding which can be gained only by a slow upbuilding through serious study of difficult material. The business man cannot doubt that imitations can never fill the place of the real goods. There is no substitute for thorough study.

HARVARD UNIVERSITY. HUGO MÜNSTERBERG.

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BUSINESS PSYCHOLOGY

PART ONE — PRINCIPLES

CHAPTER I

BUSINESS AND PSYCHOLOGY

Cultural Progress

In no direction has man progressed so much in the last two thousand years of civilization as in his commercial endeavors. We are too easily inclined to fancy that mankind has changed and has made progress in every line, but that is certainly an illusion.

No buildings have been built in the twentieth century so beautiful as those of the old Greeks, no dramas have been written so wonderful as those of their great poets, no philosophy has been thought so significant as that of the great Greek thinkers, and the statues chiseled two thousand years ago are still models for our generation. Our legal life is not superior to that of the old Romans, nor are our state and city politics essentially different from those of olden times.

Social intercourse has not changed much—we have the same motives, the same hopes and fears, ambitions and jealousies. Man is the same in his family circle; man is the same before his God. We are driven by hunger and desire for power, by love and reverence, like untold generations before us.

Science in Industry

But in the economic life with its production of goods for practical use and their transportation and distribution and the exchange of possessions the change is indeed a fundamental one. The modern factory and the modern credit system, the modern railway and steamer and cable are incomparable with the primitive methods of mankind or with anything which antiquity or mediaeval times or even recent centuries have produced. It seems as if we could nowhere measure the progress of the civilized human race more directly than in the glorious changes in commerce and industry. Every feature of the market and of production has been influenced by the wonderful inventions and discoveries and no less by the splendid achievements in new methods of exchange and organization. Harvesting machines have replaced the primitive tools of the past; electric wires spin a net of communication over the lands of the world which are united by commerce and industry; powerful works of human invention dig the mines; and in the factories operations are performed to which the highest scientific work of the physicist and chemist had to show the way.

Yes, there seems to be no science in our universities which has not contributed to this victory of the practical desires of man over stubborn nature. The knowledge of mineralogists and botanists and zoologists, of mechanical engineers and electricians, of physiologists and chemists, has been brought into service. The co-operation of the whole world is so complete that we are no longer aware how many hundreds of thousands have to work with the most perfect instruments of modern transportation and factory production to satisfy our needs. If we sit down to a meal and use the plate and the glass, the

fork and the spoon and the napkin, and take the sugar and the pepper or what-not, we give no thought to those thousand-fold processes which were necessary to bring each of those products to the grasp of our hand. We take it for granted that the best machines have worked for us to weave the napkin and refine the sugar.

All the knowledge of the century is thus made contributory to the production and distribution of the economic goods of the world, and science is the real foundation on which the business of our time rests, however little the individual business man may be aware of the tremendous amount of intellectual work which was necessary for every forward step in practical life. He presses the electric button at his desk to call the office boy or touches a switch to light the room; he uses the telephone or sends a wireless message, and gives no moment's thought to the fact that numberless scholars in their laboratories had to devote their energies to the securing of these simple effects.

Psychology in Industry

In this situation of our present day in which everybody in the world of affairs, the captain of industry and the worst-paid workingman, the banker and his office boy, the merchant and the clerk, knowingly or unknowingly make the fullest use of the results of science, it is a striking contrast to see how pitifully little use is made of that science which deals with the human mind. The science of the human mind, psychology, is today as solid, as scholarly, and as much worked out as the science of physical and chemical nature; and its field is surely no smaller, since the whole world of man's thinking and feeling and doing and remembering and attending and willing is involved.

But the progress of economic life has hardly been touched by the stream of knowledge which flows from this psychological source. The psychological expert is hardly heard of, while his older brothers, the electrical expert and the chemical expert, are much sought and respected everywhere. Yet we have only to look around us in the commercial and industrial spheres to discover quickly that after all the human mind plays the greatest role and deserves the most thorough study by everyone who would succeed in business life.

It is certainly important to know the machines in the factory, and only when the machines are well cared for and well adjusted to their purpose can the manufacturer hope that his industrial output will be better than that of his rivals. But is the mind of the workingman not of equal, or rather, of higher importance in the work of the factory? How can we expect the best output if we are interested only in the purely technical side of the process and ignore the great and significant fact that a man with feelings and emotions, with ideas and impulses, with memory and attention, stands behind the machine and has to serve and has to master it? If his attention flags, if his mental fatigue interferes with his best work, if his interests carry him away, if he has not the right mental power to discriminate what he ought to discriminate, must not the work suffer even more than by an out-of-date machine?

The business house may be installed with a splendid equipment, the department store may be a model establishment, the banking house may have its special wires and the best adding machines; yet success and failure must depend upon the achievements of those who sit at the desks or who walk the floor or who stand behind the counter, and these achievements depend ultimately upon

the mental powers of the employer and the employe. Their intellect and character, their talent and temperament, are a thousand times more important and decisive than the splendor of the technical equipment. If the right men are in the right places and if the work is adjusted to the mental conditions and mental demands, any difficulties can be overcome. On the other hand if the needs of the mind are neglected, if faulty minds are at work, if the service and output are not adjusted to the desires and feelings of the mind, the results will be deplorable, however well the technical expert may have done his share.

The Power of the Mind in Business

All business is ultimately the affair of minds. It starts from minds, it works through minds, it aims to serve minds. By industry and commerce and transportation alike the demands of minds are to be satisfied. And every step needed for this satisfaction involves the attention, the thought, the ideas, the emotions, the instincts, the impulses of human minds. Is it not absurd to call the best-trained specialists for the supervision of those machines and yet to be satisfied with the most superficial, amateurish impressions when it comes to the judgment on that much more important factor in the play, the human mind? The manufacturer takes it for granted that the chemical process by which he dyes his wares must be judged by chemists. But whether the minds of his thousands of employes are in the right attitude, are prepared for the work, and are able to perform it by their inborn make-up is left to the fancies of the foreman without ever consulting the psychologist who devotes his studies to such problems of the mind. It is as if a barrier separated the quiet, scholarly investiga-

tions of the student of the mind from the practical work of those whose success depends upon an understanding of the mind.

We can hardly imagine that this would happen in any other field. As soon as the scholars have made their discoveries in the physical laboratory, these are at once carried into the market; new machines are built and only the latest is welcome. But the faithful study of the mind is left to the psychological scholars, and the market, which is entirely dependent upon the working of the mind, remains untouched by such knowledge. Everything goes on as it did thousands of years ago. Everybody feels sure that he knows enough about the life of the human soul. Everybody behaves as if it were very difficult to understand the physics and chemistry of the commercial products, of the raw material, and of the machines, and as if it were important to gather all possible expert knowledge, but at the same time everybody feels certain that he knows enough about the mind of the customer and the mind of the workingman, about the mind of the clerk and the mind of the advertisement reader, about the mind of the manufacturer and the mind of the salesgirl. Here too he shows not the slightest interest in drawing on the knowledge of the expert and making the fullest use of the scientific discoveries.

This attitude must be fundamentally changed, and the last few years have brought a most promising beginning of such a change. Interest in the science of mental life has been awakened in the circles of commerce and industry, various conditions have favored it, and not a few far-seeing business men and many ambitious young men recognize that the commercial success of the future will depend still more upon the mastery of mind than upon the mastery of matter. Man is more important

than the machine, thoughts more valuable than equipment. Personality is the biggest factor in business.

How to Study Business Psychology

But it is sure that such better knowledge of the human mind as it enters into the market of the world cannot be supplied by a mere superficial gossiping about the mysteries of the mind. No one will have real technical control of nature who knows about natural science only anecdotes and curious little details. He must enter into a solid study of the natural facts which the scientists of the age have cleared up in their laboratories. It is not in the least different with the science of the mind. Today mere freak stories of queer mental happenings or uncanny reports of mental abnormities can never be a substitute for a thorough, detailed acquaintance with the laws of mental behavior. The man of affairs who wants to shape events in the sphere of the mind must have the energy to study the psychological science from its foundations. He must not ask at every step whether this bit of information can be of use at his desk in the office or in the factory. He must at first make himself acquainted with important facts without always keeping an eye on the practical application. In short, he must study psychology as if he had a pure interest in the understanding of the principles, just as an engineer must learn his mathematics without asking eagerly at every new equation whether he can make use of it in drawing his design.

The student of psychology who has the interests of commerce and industry and of personal efficiency at the bottom of his mind must, of course, not be drawn into byways which may lead to other fields of life. But in those chief roads to the understanding of man he must

aim toward a thorough knowledge. The essential condition for all this is only that he be convinced that modern psychology is really an exact, careful science, like the sciences of nature, and that this modern psychology has something of real value to offer to the man of practical life.

But let us not forget that there is no business psychology outside of the one great psychological science. Business psychology means a psychology in which the chief emphasis is laid on those mental functions which are significant for business life and in which so far as possible the other aspects of psychology are omitted. If anyone were to try to present business psychology without going into the study of the foundations, principles, and laws of psychology in general, he would offer useless and misleading material. The business man would at first feel more at home, because he would hear talk about the matters of his daily concern, but at the end he would stand where he stood at the beginning. He would not see the real, deeper connections of the facts, and these alone can help him to go beyond the commonplaces of daily practice.

Business psychology is psychology, or it is nothing at all. Hence we shall not be afraid to discuss many points and principles which seem difficult. Only he who has the energy to master the theory can reach a point at which he sees his mental surroundings with a psychologizing eye. As soon as he succeeds in that, he can solve any special problem for himself and is made independent of any unscientific chance advice. The basic theory is in the end the most practical.

TEST QUESTIONS

1. Has the progress of civilization been uniform in all directions?

2. What has brought about the tremendous development in industrial progress during the last fifty years?

3. Have you ever taken an inventory at the close of the day to see how many inventions and contributions from science served you in your activities of the day?

4. How can psychology contribute to industrial progress?

5. Why has psychology been neglected in practical business affairs?

6. Have you ever observed work where the mechanical equipment seemed to be modern and complete, but where the psychological conditions for the work were most unfavorable?

CHAPTER II

SCOPE AND METHODS OF PSYCHOLOGY

The Old v. the New Psychology

The psychology of a not far distant past had very little to present which could have promised help in questions of industry and commerce, of production and transportation, of selling and buying, and in all which pertains to them. That psychology of old was first of all concerned with the nature of the human soul, its freedom, and its immortality. Great thinkers devoted themselves to such thoughts concerning the life of the soul, but the questions were approached from the point of view of the general philosopher. Their results were very valuable and inspiring, just as the thoughts of the philosophers about God and the universe are of highest import.

Yet it is clear that there is a great difference between a philosopher's speculating about the universe without and a physicist's sitting down in his workshop and examining the special properties of the material things. He alone creates that detailed physical science which is sharply separated from the philosopher's ideas about the world. This same development occurred in the study of the inner life. Here too the old thoughts about the soul had an aim entirely different from that of the new work.

Today the psychologist is not concerned with philosophical ideas about the soul, but he examines the facts of our inner experience and analyzes and describes them

with the same scientific calmness with which the naturalists study chemicals. He finds that feelings and ideas and acts of will come and go in his inner life; he understands that his neighbor also has such feelings and ideas and desires and impulses; and now he simply asks from what elements they are composed, according to what laws they act, how they develop, and how they can be explained. This is no longer the interest of the philosopher who moves in general ideas, but it is a very concrete, detailed examination of a material which is accessible to everyone. There is nobody who does not find such ideas, feelings, and will-acts in himself.

Thus the modern psychologist lays all speculations aside and examines the facts. Only through this fundamental change of attitude can he become useful for practical purposes. Speculations about nature are not sufficient to build a machine, and speculations about the soul are not sufficient to prevent the overfatigue of a workingman, or to attract a customer to the window display, or to select the best-fitted man as salesman, or to develop the abilities of a bookkeeper. We must know the actual experiences and their connections with causes and effects.

The Experimental Method

This new trend of modern psychology did not begin suddenly, but the decisive time came when the psychologists began to admit the method of experimenting; and this happened about forty years ago. The facts which were discussed in earlier times were gathered by chance observations. Indeed there are many mental facts recorded in the psychological books of the old Greeks and Romans and through two thousand years in the scholarly books of many nations. But when those older authors wrote about memory or attention or feeling, they knew

these facts about the mind only through haphazard experiences, not as the result of scientific analysis.

Everybody has gone through acts of remembering or attending, has been full of joy or grief, and therefore it seems as if everybody knew these contents of the mind and could describe them. But no naturalist would be satisfied if he were to describe the chemical constitution of salt and sugar only from his chance acquaintance with them at the dinner table. If he wants to find out what salt and sugar really are, he experiments with them, he resolves them, and mixes them with other material and analyzes them with his subtle instruments in the chemical laboratory. All the triumphs of modern science have been dependent upon this method of experimenting. Only he who experiments can vary the course of events and can influence it so that he may study how a change of conditions produces a change of effects.

The psychologists recognized that this method alone could lead the study of the mind also to the height which the natural sciences had reached. They too, therefore, began to make themselves independent of chance experiences. They did not wish to wait until salt and sugar appeared on the dinner table of life; they did not wish to wait until they had to remember or to attend a thing, until they had to feel joy or sadness, until they accidentally heard tones and saw colors, formed thoughts and volitions; but they called up the mental functions for the purpose of scientific analysis.

If the aim is to study memory, the modern experimenter does not simply think about how his memory acted on a certain occasion. He takes a set of words or figures or syllables and studies how often he must repeat them before his memory holds them, what the influence of pauses is, what the influence of rhythmical speaking

is, how much is left after ten minutes, how much after an hour, how much the success depends upon the seeing or upon the hearing of those words or the seeing and hearing of them together, how much depends upon the direction of the attention during the learning process, and a hundred other experimental problems.

As soon as the question is formulated in this way he can gain exact results; he is free from all vague speculation. He can demonstrate by definite figures that this method of learning is good and that that method is poor, that this scheme improves the memory, and that that way simplifies the learning. The experimental method demanded special workshops, and it is not more than thirty-five years since the first laboratory of this kind was founded. But the movement has made rapid progress. Today such laboratories for experimental study of the mind are used in every civilized country and more than a hundred are established in the United States alone.

A Modern Psychological Laboratory

A visit to a psychological institute would hardly suggest to the casual guest that it has anything to do with the mind. Our Harvard laboratory has not less than forty rooms. The electric wires bring different currents to every wall. Large instrument cases recall the apparatus of a physical laboratory. A big workshop with its lathe for metal work in which a mechanic is busy from morning to night provides the students with the newest equipment for special researches. Eight rooms are entirely black so that no light may be reflected from their surface; one room is sound-proof. In some, very subtle instruments are installed to measure the shortest time intervals with the exactitude of a thousandth of a second; in others, very complicated arrangements allow the

worker to take a record of the smallest changes in pulse or breathing, in muscle contractions or in the flowing of the blood to the arm. In short, everything suggests interest in bodily material processes, and nothing betrays the predominant activity of this scientific institute, the study of the mind.

Object of Experiments

Yet such an impression would be entirely misleading. Not one of the questions raised here deals with the body as such. Everything has ultimate reference to the inner life, to the conscious experience. Measuring the time intervals in thousandths of a second is for us only a means to measure the length of a mental act. We want to know how long it takes to understand an idea or to connect two thoughts or to discriminate two colors or to perform a will-act. Again when we study the heart-beat or the respiration or the activities of the glands or of the muscles, we care for them only because they are the expressions of our inner emotions, of our joys and surprises and angers and fears. If we use our dark rooms and sound-proof rooms, it is not because we make investigations concerning the lights or sounds in the outer world, but because we want to understand the color sensations and the tone sensations which we find in our minds and from which we must build up the complex sense experiences in our consciousness. Not the color and the tone, but the seeing of the colors and the hearing of the tones is our problem; not the movements which we perform, but the will to perform them and the attention directed to them are what we investigate in a psychological laboratory.

But the chief feature is that these physical instruments allow us to produce those mental states whenever we need

This picture, along with a few others found in this volume, illustrates some of the most familiar instruments used in our psychological laboratories.

On the left side of the table stands a chronoscope, the standard instrument for measuring mental processes in thousandths of a second. The lower larger dial of this chronoscope indicates the whole seconds and the tenths of a second, the upper smaller dial the hundredths and the thousandths of a second. The pointers go as long as an electric current passes through the chronoscope.

In the experiment shown here the electric current is closed at the moment when the apparatus in the center of the table exposes a word, and it is opened when the experimenter speaks, as the movements of his lips break the electric current. The chronoscope shows the time from the seeing of the word to the reacting by the speech movement.

Reaction time measurements and their practical application are explained later in the text.

them for our observations. We do not know any function of the mind which cannot be brought under such experimental observation. At the threshold of the work a generation ago only very simple problems were carried into the laboratory, especially those of sensations and impulses. But every year opened new vistas. Today even the finest shades of inner life, the subtlest thoughts, and richest feelings can be approached by the experimental method. Much which a few years ago seemed still inaccessible has been conquered by the new laboratory schemes.

Animal Intelligence

While the introduction of the experiment has secured the means of mastering the processes of the human mind, the newer development of psychology has profited no less from an expansion in other ways. The visitors in our Harvard laboratory will find not a few rooms with cages and vivariums and tanks. Ringdoves can be heard and turtles seen. Yes, animals as low as the earthworm and as high as the monkey are studied in our animal department. Here too it is the mental aspect which interests us, the intelligence of the birds or reptiles or mammals, their memory-power, their achievement of attention, their emotions, their decisions to move hither or thither. The time has long passed when the story of the animal's mind was based on the gossip of the hunter or on curious experiences with ants and bees. Experiment has taken control of the whole field. Everything is carefully measured and through comparison of these mental functions in the beasts new light is thrown on the working of the human mind.

Abnormal Psychology

We can go still further. The aim to compare various forms of minds is not confined to contrasting the animal mind with the human mind. Among the human beings we may compare the undeveloped with the developed, the child with the adult, or, what is still more important, the normal with the abnormal. In both directions psychologists have found many new avenues of research. With careful experiments the development of the child has been traced from the first minutes of his life, from the first vague sensations when he tastes sweet milk, through all the stages of nursery and school life and all the phases of growing intelligence and temperament and character. The study of the mental diseases and of all the borderland regions between mental health and mental illness has been not the smallest triumph of modern psychology. We know today that the abnormal disturbances of the mind can be understood only by an exact comparison with the ordinary functions of the personality. The work of the physician has therefore been brought into the neighborhood of routine psychology, and thus has added much to the large field of mental studies.

Psychology and Mysticism

Only one region is avoided by the scientific psychologist, that which the public easily takes as the chief psychological topic, namely, the mystical states of the mind. The newspaper reader hears about telepathy and clairvoyance, about spiritualism and automatic writing, and fancies that such mysterious and uncanny products of the soul furnish the most interesting material for psychological studies. This is a complete delusion. The scientific psychologist knows that there is a sharp demar-

cation line between science and mysticism. Whoever approaches spiritualistic seances and the performances of mediums in a religious attitude is perfectly free to do so. That is a private concern of his personal conscience and of his religious faith. But whoever accepts such ghosts' returning to earth or such supernatural communications from distant souls as actual facts leaves the realm of science and finds himself in the world of miracles.

In the true psychology of our day there is nothing mysterious, and even those processes which have some surprising and easily mystifying character, like hypnotism, are entirely brought under scientific control and can be explained like other natural occurrences. They belong to that group of mental phenomena which, together with dreams and neurasthenic and hysteric aberrations, lie in the great and highly interesting sphere which is between the normal waking mind and the disturbances of disease.

TEST QUESTIONS

1. How does modern psychology differ from philosophy?
2. How does experimental psychology proceed to discover truth?
3. What are some of the mental factors that can be separated for exact psychological analysis?
4. How can physical instruments be used in experiments upon the mind?
5. What is the distinction between normal and abnormal psychology?
6. What has psychology to say about mysticism?
7. Can hypnotism be explained by modern psychology?

CHAPTER III

THE APPLICATION OF PSYCHOLOGY

Prevailing Prejudice Against Applied Psychology

The man of affairs may listen to a report on the wide scope and the brilliant development of experimental methods in modern psychological science, and yet may have a lingering doubt whether it can be worth while for him to approach such studies. Of course, as a man of culture and education, he may glance over the results of that new science with the same interest with which he may follow the reports from other fields of human endeavor, from astronomy or geology, from Assyrian history, or from the sociology of the South African tribes.

But however entertaining it may be to hear from the psychologist about the laws which control the human mind and about the mechanism of emotions and volitions, he looks skeptically into such new-fashioned books on the mind, because he has his serious doubts whether they can really serve the demands of practical life. He is willing to grant that he comes in contact with human minds at every step of his business life and that it might be a great gain for him if he could have full insight into the minds of his clerks or his workingmen or his customers. But to get some scientific formula seems very far distant from the practical business of the day. He has the instinctive feeling that his experienced traveling salesman knows much more about the mind of his customers than the most scholarly psychologist, and that his ex-

perienced foreman in the factory knows better whom to employ than anyone who comes with a proposal to examine the candidates by scientific psychological tests.

Yet may this not be a very superficial prejudice? To be sure, we trust our cook to know best how our food ought to be prepared and how to select the food. Yet have we a right to doubt that the scientific chemist and physician can determine much better the nutritive value of every element of our food and can prescribe, especially if our health is a little impaired, which diet would be the best for us and how the prescribed food ought to be prepared for our table? Moreover no psychologist would advise anyone to discard the traditions and experience of those who have stood a long while in the midst of their commercial or industrial undertaking. And even the so-called instinct of the old employe may be trusted, however often it may mislead him. The farmer may well rely on his instinctive knowledge of how the weather will change; and yet he would be dangerously old-fashioned if he were to disregard entirely the scientific meteorological reports of the weather bureau. And all his traditions concerning the treatment of the soil cannot help him so much as a scientific understanding of that which the agricultural chemists are ready to teach him. We live in the day of the scientist and the expert, and he who closes his ears to their advice will never dig the finest potatoes from his acre.

Application in the Schools

In other regions of practical life this prejudice against psychological advice has happily disappeared. The school man, the physician, even the lawyer and the artist, have found out that these discoveries of the modern psychologist are not simply dry text-book knowledge and

that the output of his laboratory is not serving only as material for general culture. They are wide-awake and are fully aware that the most useful and most helpful knowledge streams from this source.

How could it be otherwise? Must not every school-teacher in every class-room in every lesson devote herself to the mind of the pupil? She has no right to give to the child a lesson to learn which is not in harmony with the pupil's intelligence, or which makes too great demands on his memory, or which imposes too great a strain on his attention, or which causes too great mental fatigue. She has to consider the mental differences of the children and the whole rhythm of their mental activity; she must know how their ideas are linked, how their attention can be captured, how their distraction can be overcome, how their good-will can be stirred up, how their ambition must be directed, how their laziness can be overcome. She must take care that the words on the blackboard or the lines on the map produce clear images in the minds of the children, that the words which she speaks are rightly understood, that the lessons are not too long or too short, that the recess brings the right recreation to the mind, and that the training in the ability to read and write and calculate is proceeding in the order in which the mind makes the greatest progress. In short, from the nursery to graduation the mind of the youth must be understood in all its subtlest details if education is to fulfill its ideals.

Dissatisfaction with the schools was so widespread and the teachers themselves felt so strongly that their success in spite of their best efforts was too often crippled by poor adjustment of the work to the minds of the children that a great movement toward psychology has set in all over the country. Pedagogy and psychology have

become most intimately connected, and every teacher is nowadays expected to be familiar with the results of experimental and physiological psychology in the interest of a sound school life.

Application in Medicine

It is not different with the physicians. Every man to whom the health of the community is entrusted knows today what too few knew yesterday, that the patient's mind is a most essential factor in every disease. The curing process is in every bodily disturbance strongly influenced by the nervous system, and the nervous system is deeply influenced by the mind. The importance of this role of the mind is greatest, of course, when the nervous system itself is the seat of the trouble. The numberless forms of nervous disturbance, from the slightest neurasthenia to the severest forms of brain diseases, can never be treated completely without a very careful consideration of the mental factors. Only the true science of the mind can furnish such knowledge. The physician today, and not only the physician of mental diseases but every doctor who cures nervous states, therefore makes the fullest use of the subtle methods which experimental psychology has introduced. He needs mental laboratory tests to discriminate early the different forms of nervous disturbances and to examine the progress of the various states of treatment.

Application in Law

Even the lawyer is today no longer unfamiliar with the offerings of the psychologist. He cannot possibly forget that the witness and the criminal, the judge and the jury, are human minds, the working of which is decisive for the fulfillment of his purposes. He knows that

the witness may have the best will to bring out the truth and yet that his reports under oath may be deeply influenced by the limitations of mental perception and memory and attention and feeling. He must determine therefore what abilities and special mental features a witness has. If his visual memory is strong, he may be trusted in the report about what he saw, but may be entirely unreliable when he reports what he heard. Psychological tests can bring out hundreds of such characteristic traits.

Again the psychologist has methods to bring to light that which the criminal or the witness intentionally suppresses and hides. Or the psychologist may show the mental effects of various forms of punishment or may help the lawyer in influencing the jurymen or may demonstrate the weakness of the methods of the third degree. The influence of the oath on the memory and attention of the witness, the influence of fear and excitement on the criminal, the mental conditions which lead to a crime, and many similar legally important factors win entirely new character in the light of exact study of the mind.

Wider Application to Life

In short the school and the hospital and to a certain degree the court-room show an abundance of cases in which scientific psychology can be and has been applied to the practical affairs of everyday life. Teachers, physicians, and even lawyers have no right to ignore the help which psychology can bring. The modern psychological knowledge does not lie in the treasure-houses of science as gold bullion, but much of it has been coined and can be used in the intercourse of the street. Even the students of art or of the theatre or of music have the greatest interest to consider the methods by which the beautiful ef-

fects are to be produced. They are somehow to capture the mind, and each element must therefore be examined from a psychological point of view. The same is true for the scientist and for the scholar. When the astronomer observes the stars, he must know how his mind works. Many kinds of illusions enter into the impressions from the outer world. It is important to recognize their sources in the mind. If the historian relies on the reports of witnesses and tells what others see in peace and war he must be able to estimate the truth of such reports and can do so only if he understands the minds of such chroniclers.

Thus we see psychological knowledge made serviceable for very different human enterprises. Everywhere it has brought ample success. Have we a right artificially to keep it away from the gigantic field of economic endeavors, from commerce and industry? May we not hope that it will have here the same splendid development that it has had in education and medicine?

The teachers and physicians and still more the lawyers originally had the same suspicion of psychology and its practical applicability as the commercial and industrial workers have today. This suspicion, mostly based on insufficient acquaintance with the field, will fade away in economics just as quickly as in pedagogy and in pathology. What is needed here, as in those other fields, is only that real co-operation be established. The true progress of applied psychology in the school life began only when the teachers did not simply wait until the psychologists had completed the work but when the psychologists and teachers joined hands. The teachers had to offer their problems out of the midst of school life and had to work them out under the guidance of the psycholo-

gists with psychological methods. The physicians did the same. Unselfish co-operation produces results.

Application to Business

The business men must come forward with similar confidence. The actual problems of store and factory and office must be turned over to the psychologist. On the other hand the psychologist would be guilty of misleading the business man if he promised him miracles. The progress must be slow and disappointments are never impossible. The psychologist has no ready-made prescriptions for turning poor business into sudden prosperity or for filling every place with the ideally adapted man only. The application of psychology to the concerns of commerce and industry is the latest chapter of applied psychology, and therefore shows more than others the traits of youth. But also from this point of view it may be said that the progress will be the safer and the mastery will be the surer the more we have the patience to study the practical problems on a solid foundation of a real understanding of the whole mind. There is no short cut which leads directly to the facts of applied psychology. We must always first understand the general standards of the mind and the regular behavior. In other words we cannot avoid studying general psychology before we try to make use of it for the special purposes of the market.

It cannot be denied that the so-called psychological literature on business proceeds in a very different way. There are many books on selling or on business administration or on shop management or on industrial work which are excellent as far as the technical and economic and mechanical points are concerned. But wherever they approach the mental life they do not really speak the

language of science but the language of the street and of the newspaper, and so open a gulf between the popular information which they furnish and the scientific understanding of the processes which the psychologist tries to supply. The different language is only a symbol of the different thought. All the conceptions with which such popular business books and business magazines work belong in a sphere of ideas which cannot possibly lead to any deeper understanding. They refer to the surface view. They never enable us to explain the processes from their real causes and to recognize the underlying laws. They condense, if they are well prepared, the advice of experienced business men.

They are just as useful as the hundreds of medical prescriptions which we read in the health corners of the Sunday newspapers. Such prescriptions may be entirely correct and he who acts according to their rules may be better able to fight a cold or to get rid of rheumatism than his neighbor. But to pick up a few such ready-made rules is hardly to be compared even with a beginner's study of the elements of medicine based on an insight into the structure and the functions of the normal and of the diseased organism. Only he who understands such principles of scientific medicine knows where those prescriptions are in order. He who relies on such surface cures for single symptoms may just as well apply tomorrow a prescription where it does not fit the case at all. The true source of the pain may be entirely misunderstood and an outside resemblance of chance symptoms may lead to a treatment which is ruinous.

Really to understand mental conditions in business means to understand the structure and function of the mind. As soon as the lasting principles of mental life are grasped, the special rules become clear as their con-

sequences. Only where such a connection with an underlying thorough understanding of mental life exists have we a right to speak of a psychological treatment of business questions. The common-sense talk about the mind which fills many of our business books is not psychology and can never be real psychology. It is easy to use one's mind; every child does that. But it is difficult to understand it.

TEST QUESTIONS

1. Up to this point in your life have you had a prejudice against practical psychology? Have you been indifferent?
2. How is psychology applied in our modern schools?
3. What are some of the psychological methods used by a modern physician?
4. How can a lawyer make use of psychology?
5. Why should the artist be familiar with the laws of psychology?
6. Why should the business man and the capable psychologist often join hands in solving business problems?
7. What is the nature of much of the popular writing on business psychology? Have you followed any such advice?

CHAPTER IV

THE MIND AND THE BODY

The Material for Psychological Study

What is the material which the psychologist is really studying? The astronomer studies the stars and their movements, the botanist studies the plants and their growth. Everybody easily understands what their fields of work are. It is also simple to see what the historian or the student of languages or the mathematician or the economist has to study. But when we ask ourselves what the student of the mind is really to investigate we find difficulties.

Let us turn to our practical interest. We want to know the mind of the customer who enters the store. Only if we know his mind can we be sure to please him, to satisfy his wishes, to draw his attention to the goods which we offer, and to convince him that it is to his advantage to make the purchase.

Or we want to know the mind of the young man who is to be appointed as clerk in the office. Will he be a faithful worker? Will he not be careless? Will he have a good memory for the names and the details which come up in business? Will he be honest? Will he devote himself to the interests of the firm? Will he waste his money or will he be saving? Will he be intelligent when responsibilities fall on him? Will he be hasty in his decisions?

Or we want to know the mind of the workingman who has to feed the machine in the factory. Will the work

fatigue him so that his fatigue makes him liable to carelessness and, through that, to accident? Has he the mental ability to look out for all the details of the mechanical work? Can he follow the speedy rhythm of the machine? Will the monotony of the work disturb him? Will he know how to help himself in a difficulty?

Or we want to know the mind of the traveling salesman. Will he have the power of suggestion which wins the customer? Will he spread the right atmosphere of confidence? Will he be industrious and loyal? Will he understand the needs of the retailer with whom he deals? Will he be discreet? Will he be temperate? Will he be quarrelsome?

Or we want to know the mind of the banker to whom we trust our deposits. We even want to know the mind of the passer-by on the street who sees our window display or reads the poster with our advertisement. Will his mind react favorably upon our announcement? Will he like that picture? Will he feel ready to yield to our appeal? What is going on in his mind or in anyone's mind with whom we have any commercial or industrial or technical or financial dealing? There is no end to such questions, but what is really meant by all of them? What is that peculiar object of our inquiry?

The Individual's Consciousness

We surely do not ask about the soul of all those people from the workingman to the banker, from the advertisement reader to the floorwalker. By the word "soul," mankind has always understood that deepest core of the personality which is itself not accessible to any inner observation but which we grasp in our moral and religious thought. Our interest is entirely different. We want to know the actual experiences; we want to know that

which really happens and which can really be traced and observed in the individuals. Not the soul of the clerk or of the customer, but his positive ideas, feelings, memories, desires, and volitions are our concern.

Yet, even if we agree on that, there may still be a difficulty in finding our material, because we can look on all these feelings and memories in two very different ways. We may ask, first, what the men themselves really experience. Their memory-images or their feelings of fatigue or of monotony, their desires and their decisions, are then the true material for our psychological interest.

Of course, we cannot directly become aware of them. We cannot look into the customer's mind and perceive there his joy in our showcase or his dissatisfaction with our price. This joy and this dissatisfaction are emotions in him which no one but he himself can feel and therefore of which no one but he himself can be aware. If we want to make clear to ourselves how his joy or his anger feels we can do nothing but remember when we ourselves were joyful or angry. And, if a workingman is fatigued, his feeling of fatigue can never be something which we can grasp directly. He finds that fatigue in his consciousness, and if we have never felt fatigued we cannot know how it feels, just as a blind man can never know how it feels to see red or green.

Everyone has his content of consciousness quite for himself. No one can break into another man's mind and lay hands on any of his mental possessions. His memory-images are his own. I may remember the same incident which my neighbor remembers, but his memory-idea and my memory-idea are two entirely different contents of mind, in spite of the fact that they refer to the same event. We can never exchange them. He cannot feel my memory-image or I, his. And if I want to con-

sider the characteristics of his experience of remembering I can do it only because I know from my own experiences how such a memory-act feels.

We might say therefore that all our interests in the mental life of those people in store and factory and counting house refer to those inner states which everyone can experience only for himself. Our psychological study is to analyze those states and to trace their laws and to make us understand what we have to expect in every situation from the conscious developments. The study of the mind becomes in this way a study of the contents of consciousness. Everything which is not really felt by someone or which has not an immediate influence on somebody's inner experiences lies outside of our feeling. The mind is that of which individuals become aware as their inner experience.

Consciousness Revealed by Behavior

But now we may take an entirely different point of view. We said that the customer in the store interests us as psychologists because we want to discover what his likes and dislikes are, what his preferences and decisions are, what his turn of attention and his liability to suggestion are. What does all this mean but the customer's turning to this or to that thing on the counter, taking up the one and throwing aside the other, choosing and paying for the one and never inspecting the other? And if we are interested in the workingman's mind, what does his fatigue mean but his decrease in efficient work, his doing it slowly and carelessly? What does his eagerness mean but his doing the work with unusual persistence? What does his intelligence mean but his ability to perform those movements and actions which are best fitted

for the particular situation? This is exactly the case everywhere. Actions reveal the inner life.

We are interested in the mind, and yet all which is really important for us is the man's kind of action and his outer behavior, his speaking and handling and turning and moving, in short, processes which we can perceive from without. We want to know whether the clerk's mind is honest, but that means to us after all only whether he will make correct entries in the ledger or not, whether he will take money out of the cash drawer or not, whether he will speak true words or untrue ones. Yet every one of these actions can be seen or heard or otherwise found out from the happenings in the outer physical world.

We can generalize this. If we have a practical interest in any man's mind, the truly important factor is the man's way of action, his outer behavior, that is, the chain of processes which go on in his body. All his actions indeed are evidently bodily events. His spoken words are movements of his lips and tongue and vocal cord. His eager work is a chain of movements of his arms and fingers and legs, and even his taking money out of the cash drawer is a bodily process. To be sure, if all these bodily actions in speaking and reading, feeding the machine or selling over the counter, entering the shop and paying for the goods, were simply physical processes of the body, like the action of the heart or of the stomach, the behavior of the individuals could not be called mental at all.

We take it for granted that the turning of the customer to the one box and away from the other is felt by him in his consciousness as an inner experience of liking and desiring the one and of disliking and avoiding the other. But for practical purposes it makes no difference

whether we take the trouble to awake in him the mental liking for our goods or whether we stir up in him the physical impulse to turn to our goods. His outer behavior and his inner experience then appear to us as merely two different expressions of the same event. The consciousness and the body with its actions are two different aspects of that reality which we want to study as practical psychologists. *Hence "mind" means for us both that which everyone finds in himself, in his inner private consciousness, in which nobody else can directly take part, and at the same time the particular kind of bodily behavior in which the personality expresses itself and which is open to everyone's perception.* Thus the mind which is aware of its feelings and the body which shows a certain behavior in contact with the world cannot be separated in our psychological, practical interests. Whenever the mind is influenced the behavior changes and whenever the behavior shows characteristic traits we refer them to the mind of the personality.

The Perceptions

This intimate relation of mind and body has been the object of very thorough study. The chief topics of such study have been first of all the perceptions, that is, the processes of seeing, hearing, tasting, smelling, and touching the outer world. Whenever we become aware of the display in a shop window, the visual impression of the gowns can arise in our mind only if their colors, that is, the light rays, stimulate our eye. If we close our eyelids the perception of the beautiful display disappears. We can now examine in detail the processes by which those colors behind the window glass influence the apparatus in our eye, and how the excitations from the sensitive parts of the eye are carried on to our brain and produce

there the vivid impressions. The details of our sense-impressions form nowadays a whole science, and every bit of it is the story of contact between body and mind.

Will-Actions

While in the perceptions the process begins with the bodily excitation of the sense organs and ends with the impressions in the mind, the order of events is the opposite in our will-actions. Here we first become aware of our desire or wish or will as something in our consciousness, but we enter into a real will-action when this will-impulse is linked with a movement of the body. We want to see what time it is, and while we become aware of this wish our hand grasps for our watch. The events proceed here from the inside to the outside, but here too, as in the perceptions, mind and body interest us together. The detailed study traces the exact ways in which the will-excitement is carried from the brain to the muscles.

The Unity of Bodily and Mental Life

The intimate relation between mind and body presents itself not only when the sense organs stimulate the mind or when the mind works on the muscles. In a still more interesting way the scientist finds their unity in the whole character and rhythm of our inner life. Everybody knows how the whole mental life is changed in the dreams of our sleep. The sleep is a bodily state which the chemical products of fatigue produce by poisoning the nervous substances. As soon as this process of the brain cells occurs we find the whole mental life completely reversed by the fantasy of our dreams.

In a similar way any chemical substances which we introduce into our blood by way of our stomach may have strong mental effects as soon as they reach the brain.

If a large amount of alcohol is absorbed by the body, the mental life may be deeply altered during the period of the intoxication. Ideas rush through the mind, the usual prudence is forsaken, the emotions take the character of exaggerated hilarity, while impulses arise which ordinarily are suppressed. The purely bodily change thus involves a strong mental change too. Even a cup of tea may make the mind more social; hashish may bring raptures of delight; other drugs cause a mental depression; again others interfere with the memory. Ordinary fatigue, long before sleep sets in, also has its bodily consequences, and yet they may be noticed first of all in the decrease of mental activity.

The facts become still more striking in cases of disease. Any disease in certain parts of the brain is accompanied by mental disturbances. If the brain cannot develop normally, the child's mind remains idiotic. If the brain degenerates, a paralysis of the mental function sets in. The more the microscopical study of brain defects progresses, the more we understand the subtle connections between particular bodily disturbances and particular mental abnormalities. If by the breaking of an artery the blood destroys certain rear parts of the brain, the patient becomes blind. If the destruction reaches other brain parts, he may become deaf. Again there are definite regions in the brain which are so intimately linked with the mental process of speaking that their lesion involves the loss of speech. The development of the brain from birth to adolescence corresponds to the steady development of the mental functions. In short the modern scientist can bring together material from many different quarters to prove that normal and abnormal happenings in the body are exactly corresponding to changes in the inner mental experience.

The Functions of the Brain

These last illustrations, however, already suggest that we have no right to speak of body in general, but that we must refer to a special organ, namely, the brain. The mental events run parallel to the brain processes. As soon as the brain processes are repeated, the parallel mental processes are repeated too, or we may also formulate it in this way: *Every change in the mental experience corresponds to a change in the brain processes.* These brain processes are the physical causes of the behavior of man. Whatever man is doing is done by muscle action, and these muscle actions are caused by the foregoing brain processes. This is the reason why it makes hardly any difference for our practical purposes whether we speak about the mental experiences of a man or about his bodily behavior. The bodily behavior is only the effect of his brain changes, and those brain changes always go together with his mental experience.

How is it possible for the brain to perform this extremely complex work of controlling man's entire behavior? To come nearer to this problem we may look on the brain for a moment without any reference to the mind and ask ourselves what the brain is, purely as an organ of the body. The answer is this: The brain is an organ which intermediates between the sense organs and the muscles.

The brain is connected with the sense organs by the sensory nerves and with the muscles by the motor nerves. The sense organs are not only the eye and the ear and the tongue and the nose, but also the whole skin and the fine organs which lie in the inner parts of our body and which receive their messages from our inner body. These sensory nerves either reach the brain directly or pass at first

through the spinal cord, the prolongation of the brain through the whole back. In the same way the motor nerves go either directly from the brain to the muscles of the head or they pass from the brain through the spinal cord to the muscles of the limbs and of the trunk.

Millions of excitations are carried from our sense organs to our brain and millions of impulses are sent from our brain to the muscles of the organism. It is the brain which is the great central switchboard connecting the right sense-impressions with the right motor responses. Those sense-impressions represent the outer world; those muscle contractions are actions of the personality; the brain has to take care that the actions are well adjusted to the surrounding world.

How can this be achieved? It would surely be impossible to understand it if we think of the brain as one simple organ, but the metaphor which we used when we called it a central switchboard brings us nearer to the understanding. In a telephone system like that of the city of New York the wires from hundreds of thousands of transmitting instruments lead to the central office and from the central office the wires lead to hundreds of thousands of receivers. The central station secures the connections between the right transmitter and the right receiver. In the brain we have nerve fibers instead of wires and in every brain the number of these nerve fibers which connect various parts of the central apparatus is a thousand times greater than that of the connections in New York. But in principle it too is a system of connecting paths of tremendous complexity.

The Neurons

The element of the whole system is an apparatus called the "neuron." It consists of three characteristic parts,

a central part, the so-called cell body, visible only under the microscope, and two arms which branch off from this cell body in opposite directions. The cell body is a little lump of living substance which may have the form of a ball or of a pyramid or it may be similar to a star. The two branches are very different from each other. The one is usually short but it is formed like a bush with a thousand twigs. The other may be short or long, but it has few side arms and ends in a fine brush of fibers. Two neurons never grow into each other, but they touch each other. The endings of the long arm of the one clasp into the endings of the short arm of the next, and where they come in contact the excitation can go over from the one to the other. The short branch receives and the long branch sends the message, but it always goes through that little central body.

Now about a billion such neurons stand in connection with one another. Some millions form the sensory nerves, some millions the motor nerves, but by far the largest number intermediates between the sensory and the motor neurons. Those parts of the brain and the spinal cord in which the cell bodies are clustered together appear to the naked eye as grey substance and those parts which are essentially made up from the branches appear to the naked eye white. In the spinal cord the grey substance is in the center surrounded by white substance. In the brain the chief region of the grey is the outer layer, while the inner parts of the brain are many connecting fibers. That outer layer, the so-called "cortex" of the brain, contains the chief end stations for all the sensory paths and the chief starting stations for all the motor paths. If a stimulus reaches such a sensory center, for instance, if we hear a cry, this may irradiate from that sensory center in the cortex to hundreds of thou-

sands of other neurons which finally lead to those motor centers by which the impulse is given to listen or to run away.

The Physical Basis of Human Behavior

The foregoing brief description of the brain and the nervous system contains valuable suggestions for our practical problem. The growth of the nervous system is clearly a problem of developing a network of paths which create a useful connection between the senses and the muscles. The more highly the nervous system is organized, the more possibilities there are for making such connections. Man's nervous system is, of course, the climax. This understanding of the real relation of nerve connections to human behavior enables the psychologist to suggest practical methods of training for bodily and mental efficiency.

In this connection one more fact should be noted. The higher the nervous system stands in the scale, the more it is able to produce actions in response to such things in the surroundings as are not immediately exciting the senses but which were parts of earlier experiences. The animal smells a scent; this scent awakes in the nervous system that excitement which at an earlier experience was connected with that particular smell and the sight of a prey or of an enemy, and now the smell and the after-effect of that earlier sight together stir up the action of attack or escape. The more richly the nervous system is developed, the larger is the possibility of such after-effects from previous impressions.

In man the actual impressions of the moment are only a small fraction of the excitements in the brain which lead to action. The far larger part consists of the after-effects from that which had reached the brain be-

fore. The trillions of excitations which have come to our brain from the first days of our life, the lights and sounds which we have seen and heard, including the words which we have read and to which we have listened, all have their after-effects on our nervous system and work together to make us respond by this or that action of our hands or lips. Thus the scientist considers this whole mechanism of behavior as a quite explainable natural apparatus. But he understands, of course, that the mental process is much more than the mere physical reaction, inasmuch as all these brain processes which link the impressions with the actions are accompanied by the inner experiences.

The Practical Problem

If we want to describe simply the inner experiences, the actual feelings and emotions and ideas and volitions, we must rely entirely on our consciousness and analyze what we find in ourselves. But if we want to explain the succession of events, we must turn to these brain processes in the body. The one cannot be separated from the other. They are two aspects of the same experience. The customer, the workingman, the salesman, the clerk, the banker, the advertisement readers, and all the rest are minds which have a special content of consciousness, but they are at the same time brains which produce a certain kind of behavior. If we were to consider only the mental act and were to describe its elements, we should leave out the physical action and yet these outer actions are practically the most important part of the process for us.

On the other hand if we were to consider only the actions and their brain causes, that is, if we were to confine ourselves to the physical side, we should omit that which

makes those men really human for us and which gives meaning to their experience. Hence we must always consider mind and body together. We must analyze the mental states as they are perceived and felt and desired, and we must at the same time understand them as accompaniments of brain processes which form the connecting link between the sense-impressions and the actions.

The detailed study of the essential mind-acts must therefore begin with those experiences which result from the sense-impressions and must end with those through which the outer actions are brought forth, and between these two ends, that is, between perception and will-activity, must lie the study of all those mental states which correspond to those linking processes in the brain, the memories, ideas, and thoughts, the acts of attention and feeling and emotion, of suggestion and imagination and desire. This will be the order of our analysis.

The Three Great Factors of the Mind

The perceptions stand in the nearest relation to the memory-ideas and to the thoughts. They all form parts of our knowledge concerning the world. We may group them together as a unit, and in the same way we may combine all the other mental functions into two other groups, the one containing everything which refers to the personal attitude, and the other everything concerning the impulse to action. Man's knowledge of the world, man's interest in the world, and man's action toward the world are the three great factors of his mind. This is true from whatever standpoint we may look on it, whether we consider the mind as an inner experience of consciousness or as an organization of our behavior.

Knowledge, interest, and activity are combined wherever man is considered in his importance for commerce and industry.

TEST QUESTIONS

1. What psychological problems are involved in selecting a clerk? A mechanic at a machine? A banker?
2. How is the mind related to this problem?
3. How can you actually find out what is another person's content of consciousness?
4. Why is it possible to read a person's mind by observing his bodily behavior?
5. What is meant by the perceptions?
6. What are will-actions?
7. What are some familiar illustrations that show the unity of bodily and mental life?
8. What is the real function of the brain in our life process?
9. What physical changes take place in our nervous system in the learning process?
10. What are the three great factors of the mind that are of practical importance to our problem?

PART TWO — KNOWLEDGE

CHAPTER V

SENSATION

Nature of Sensation

If anyone in the world has to deal with concrete realities and must know the facts of the outer world as they really are, it is the business man. He cannot base his work on thoughts and ideas and fancies. What he is doing is part of that great world machinery by which mankind masters stubborn nature in the interest of satisfying human needs. Whether he digs the minerals or harvests the crops, whether he transforms the raw material of nature into the finished products of the factories or carries this output to the merchants of the land, whether he sells these wares or distributes the standard ware of mankind, money, or whether he helps such production and distribution in a high or in a low place, in the office or behind the counter, in every case he must have a clear view of the objects of the outer world.

The things which can be seen and heard and touched make up the world to which all business refers. Our first interest in the actions of the mind thus turns to the knowledge of the things which surround us, which we have to handle and to use. How do we perceive their colors or their noises, their weight or their temperature, their taste or their smell, their shape or their size, their number or their movements, their rhythm or their duration?

Everybody knows how easily we are deceived by the outer world. Illusions creep in. It may be that such illusions are sometimes quite valuable for the business man. He may be anxious that the things which he puts in his shop window appear larger than they really are or more numerous than their objective number. But nobody wants to be deceived. Even the office boy may have to suffer if he does not know that in a certain light the blue stamp may appear green or that the large envelope on which he has to put stamps may appear lighter than a small one of the same weight. Whether we want to make use of the illusions of our senses or whether we want to protect ourselves against them, we must know first of all how our senses work and how we can rely on our perceptions and where the limits of our sense-functions lie.

But we may discriminate the contents from their order. If we see a red or green or blue point, we may study the color impression and examine why it appears greenish or reddish or bluish. But if we see three blue points, or if we see the blueness spread over a whole area, or if we see blue points arranged in star form, or if that blue point lasts now for a second and now for ten seconds, or if the blue light alternates with the red light, then we are no longer interested in the content of our impressions but in the order of them, their space order, their time order, their number order. Every true perception of the outer world involves both. We must always ask: What is the mental material from which these impressions are built up and what is the special combination which gives us the idea of their length and form and time? These contents are called by the psychologist "sensations." A mere tone or noise or smell or taste or color is a sensation in the mind.

Complexity of Sensations

Our real experience of the world is, moreover, always a combination of such sensations, and only through the combination do things get their space and time form. We never see simply a patch of color, but we have before us perhaps a package in brown paper which has definite size and which stands before us at a definite distance. Even when a bell rings, we do not simply hear a tone, but it is a tone which lasts for a definite period and which comes from a special point in space. We speak, therefore, first of the sensations only and then of their combinations in real perceptions. But indeed we must not forget that these sensations are only the elements from which the real impressions are built up. They themselves are not complete; they are only the material out of which the mind shapes true impressions which always contain reference to time and space.

Light Impressions

The most important group of impressions is certainly that of the light sensations. We live in surroundings which we know first of all from their optical nature, and everyone is aware of the infinite manifoldness of colors. The ribbon counter of the department store may have an abundance of colors, and yet the girl who wants to match the ribbon with her gown finds that just that particular color is not to be had. It seems entirely hopeless to try to give a real account of all the lights which our eyes bring to us. The psychologist, however, is not alarmed by this task. On the contrary he soon discovers that this chaos can be brought into simple order, because what at first appears a simple color may be analyzed into still simpler elements. The abundance may result from

the combination of rather few elements, just as the richness of our words in the language results from the combination of the few letters of the alphabet.

But the letters are combined in the word in an external way, one standing beside another. This is not the case with our color-impressions. They are mixed in the mind; they are felt as if they were one, and only by a comparison with other colors can we resolve one color into several. A pure purple standing alone looks just as simple as a pure yellow, but if we arrange a series of mixtures of red and blue, beginning with the pure red and adding more and more blue until we have an almost pure blue, then we find our purple in the midst of that series, and in comparison with the others we recognize that it is a combination of reddishness and bluishness. Or that sensation which we call orange can by comparison be recognized as a mixture of red and yellow. What we call grey of any shade is the mixture of white and black. Our pink appears as a mixture of red and white, the brown as a mixture of yellow and black, the olive a mixture of green and black. If we carry through this analysis, we find that there are ultimately only six simple elements of visual sensation, white, black, red, yellow, green, and blue.

LIGHT COMBINATIONS

The combinations of white and black give us the colorless light grey sensations, while all the colors result from the combinations of those four other elements with one another or with the white and black. It can easily be seen that the number of combinations is unlimited, as any of these colors may enter into the mixture in any amount. The combination of white and red, for instance, is not confined to one particular pink, but if we take white water and red claret wine a few drops of wine in a glass

of water may give us a white which contains just the slightest possible tint of red; the more wine we pour in, the more reddish becomes the pink until its whitishness disappears altogether and we have the pure red color effect.

Between such a reddish-white and complete reddishness there are many steps which the psychologist calls "different degrees of saturation." He speaks of a fully saturated color whenever no whitishness or greyishness or blackishness is in it, and the more this colorless element prevails, the lower is the degree of saturation. As long as we consider only the fully saturated colors which result from mixing pure red with yellow, or yellow with green, green with blue, or blue with red, we get about 150 different colors and each of them can by the mixture with white or black appear in any possible degree of saturation. Moreover each of these colored lights can pass through any degree of strength or intensity. Thus it is not surprising that hundreds of thousands of different color effects can be produced.

THE PHYSICAL BASIS OF LIGHT SENSATIONS

The physical sources of these lights are waves of ether, the same kind of waves as those which carry the wireless messages. But the waves of the wireless telegraphy are very long, the light waves extremely short. They follow one another in very rapid succession. The slowest light wave we can see at all consists of four hundred and fifty billion waves in a second; that gives us the impression of red. The quickest has seven hundred and ninety billion in a second; that gives us the impression of violet.

The condition for our seeing is that these very rapid ether waves reach the fine nerve endings in the background of our eyeball, the so-called "retina." These fine

nerve endings, of which about half a million are in each eye, form all together a kind of hollow cup which works like the photographic film in a camera. By the lens in the front of our eye the light which comes from one point in the outer world is thrown into one point of this retina. If we look into a room all the hundreds of thousands of nerve endings are excited at the same time, each one getting the light from one point. All these excited nerves are carrying their message to the brain, and there the visual sensations arise.

The special color depends upon the rapidity of these ether vibrations. If those vibrations become stronger, the light appears more intense, and if different kinds of light are mixed, then the light decreases in saturation. What we call colorless light, the white and the grey, is usually a mixture of all kinds of lights, as indeed our white sunlight contains all possible rays. The rainbow colors of the spectrum show this, as they appear when the sunlight is dispersed by a prism.

MODIFICATION OF LIGHT SENSATIONS BY THE EYE

It is not enough, however, to understand that our color impressions correspond to certain light rays in the outer world. The processes in our eye are not simply transforming those light rays into our sensations; they are influencing one another. Only if we understand these mutual influences of the eye nerves can we foresee what a man will really perceive. Take this case: If we cut a grey piece of paper into little strips and we put one of the strips on a blue background, another on a red, another on a green, and one on a yellow background, we should no longer be able to recognize that they all were taken from the same sheet. The grey strip on the blue background looks yellowish, on the yellow background bluish,

on the red background greenish, and on the green background reddish. This shows that any impression on our eye is influenced not only by the light rays at the particular spot, but also by the surrounding rays. This holds true of every kind of vision. It is always influenced by all the lights which enter into the eye. It makes a great deal of difference whether the desk of the clerk stands so that while he is reading or writing strong masses of light from the window or from the lamps must fall directly into the side parts of his eyes.

But our vision is not only dependent upon the surrounding impressions. It is no less influenced by the foregoing visual stimuli. If we look into an incandescent lamp, we can still see the light for a long while after turning our head toward the dark wall. If we look into a red lamp, we can see on a grey wall green spots, and if the lamp is green, we may get as an after-image red spots. Whatever we see is thus influenced by that which reached our eye immediately before. Moreover we see all the colors only in the central region of our field of vision. That which falls on the side parts of our eye has not any color at all for us, but appears only light or dark. Not a few men, about 2 per cent, have no sense of red and green; they are color-blind. If light becomes weak, as in late twilight, we all are entirely color-blind; then everything appears only grey and black. But our eye does not furnish us with colors if the light becomes overstrong either. Seen through a blue glass, the sun does not appear blue but white.

We do not want to enter into the more subtle details of this visual process. It is only important to emphasize that our seeing of the surroundings is entirely dependent upon the laws of the nerve endings in our eye. One fact suggests itself even from these short observations which

we have mentioned, namely, that red and green stand in a specially intimate relation, and also yellow and blue. They are the so-called "complementary colors." If they are mixed the color disappears altogether. If we have a pure yellow and a pure blue glass and put the one above the other, we see no color at all. On the other hand the one re-enforces the other if it precedes it, or if it surrounds it. If yellow costumes are to be displayed, a blue background would be the most effective, and if the gowns are blue, no background could make them more striking than a yellow one. The same relation exists for red and green. In a poster red figures become far more influential if there is a greenish background.

Sound Sensations

The world of sound sensations is somewhat further removed from the interests of the business man. Of course, every spoken word belongs to the sphere of sound and even the melody which the office boy whistles is sound. But tones and noises are much less essential with regard to their sensation content. The words which are spoken interest us through their meaning, but not through their mere sound. It is important for the salesman that he see the colors of the wares correctly, but the sounds of the words which the customer speaks to him are to him indifferent as long as he understands correctly the meaning of the phrases. It may be sufficient to say here that all the sounds are either essentially tones or noises. The tones vary in their pitch from the lowest tones to the highest, in their intensity from the strongest to the faintest, and in their timbre, that is, the particular tone character which results from the various instruments. A tone of a special pitch does not become higher or lower, if it is given now by the piano, now by the human voice,

now by the violin, now by the trumpet, but its timbre is very different in each of these cases.

The physical causes of these tones are vibrations of the air in the direction to and from the ear. The lowest tones demand about thirty vibrations per second, and the highest which the human ear can hear demand about forty thousand. Between these two limits about ten thousand tones can be discriminated by a good ear. Out of these only certain tones are selected for musical purposes, namely, those which stand in simple numerical relations. We select for music only those tones which have a number of vibrations for which the relation can be expressed by small figures. One to two gives us the octave, two to three the fifth, four to five the third, three to four the fourth, three to five the sixth, eight to nine the second. That is, if we start from the tone of one hundred vibrations, the tone of two hundred is its octave, the tone of one hundred and fifty is its fifth. If several tones stand together, complex air waves result, which are resolved by the mechanism of the ear. We can hear a whole symphony over the telephone; yet there is only one simple iron diaphragm in the telephone, which at every moment swings under the influence of the vibrations which come from the hundred instruments of the orchestra. The ear disentangles that complex wave into those elementary waves which each instrument produces.

The timbre which is characteristic of every instrument also results from such a combination of waves. Each violin or flute or piano or mouth cavity has its special combination of faint accompanying so-called overtones which melt into the chief tone. The inner ear contains a series of perhaps ten thousand little strings which, like a harp, respond to the vibrations of the surroundings. If a tone of five hundred vibrations comes to the ear, the

liquid in the inner ear enters into five hundred movements a second, and in that long harp of ten thousand microscopical strings the one string enters into vibration which is itself tuned for the five hundred movements a second. Then this one string carries the excitement to the brain in a special nerve fiber and gives there the one tone.

If tones which are not musically related sound at the same time, a rough interference results. We hear beats, a kind of rough flickering of the sound, and if many such disharmonious tones come together, this roughness suppresses the tones and we hear nothing but noise. All the lasting noises, like most of the speech elements, result from such mutual interference of tones. The short, explosive, clicking noises, however, are produced when one strong to and fro movement of the air excites the ear. At least two such equal movements are necessary to give us a tone.

Taste and Smell Sensations

Taste and smell by their relation to the food industries are of great significance for the economic life. It is essential to understand that much which we call taste is really not true taste sensation. The psychologist recognizes only four kinds of taste, namely, sweet, salt, sour, and bitter. The thousand-fold tastes which eating and drinking can bring to consciousness result from the combination of these four simple taste sensations with tactual impressions in the mouth, with temperature impressions, and especially with smell impressions. Whatever we eat sends its vapors from the rear part of the mouth into the nose. Different kinds of meat or tea or wine or candy could not be discriminated, if we had to rely on taste sensations only. The softness or hardness, the warmth or

coldness, and above all the flavor are superadded to the mere sweetness of a sweet dish or to the mere bitterness of the tea. Those few true taste sensations are perceived with the help of the sense organs in the mouth. Those for the sweet and salt are mostly at the tip of the tongue and the edges, while those most sensitive for bitter are more frequently at the root of the tongue. Only liquids can stimulate these little sense organs. That is, a hard thing like a lump of sugar cannot give a taste impression on an entirely dry tongue. The wetness of the tongue must dissolve the surface of the lump.

The smell sensations, in striking contrast to the taste, are numberless, and it is almost arbitrary when we group them into a number of large classes and speak of the aromatic smells of the flowers or of the foul smells of decaying substances, and so on. Fine nerve endings in the upper channels of the nose receive these messages when the smell substance is carried by the passing stream of air. The sense organs become fatigued very quickly. Very soon the mind is adjusted to the smell and loses the impression. Certain smells stand in contrast relation; after fatiguing the nerves by the one the other is felt the more strongly.

Our So-Called Fifth Sense

The sensations which are usually grouped together as those of a fifth sense can hardly be treated as sensations of one kind, if we take the scientific standpoint. The touch impressions, for instance, and the temperature impressions may both be received by the skin. Yet they are mentally quite different, and moreover they are dependent upon different sense organs in the skin. Not every point on the surface of our body can receive messages of cold or warmth or pressure. If we cool the point

of a sharpened pencil in snow and move it slowly over the back of our hand, we feel that at certain points a sharp, cold impression flashes up. We might mark these points with little crosses. If we now warm the pencil and move it along the same way we feel the warm impression appearing also at special points, but never at the same ones which gave us cold. We may mark these warm points with little circles. But if finally we begin to take the pointed pencil when it is neither warmer nor colder than the hand and simply try to find the places where the skin is most sensitive to pressure, we discover that these places of tactual sensitiveness are neither where we made the little crosses nor where we marked the little circles. Thus the skin contains three different kinds of sense organs, one which receives the cold impressions, one which is adjusted to the warm impressions, and one which serves the perception of touch.

But we may add still a fourth group. If we take a sharply pointed pin which easily penetrates the superficial layers of the skin, we can find certain points at which a sharp pain sensation arises, while at other points this is absent, unless our pin reaches the nerves in the deeper layers. This shows that the skin also contains special organs for pain. To be sure, in practical life we usually call pain not a sensation but a feeling. But the word "feeling" is used in psychology in a narrower sense. Feeling refers always to our personal liking or disliking, to the pleasantness or unpleasantness. Now it is certain that every pain sensation is disliked, is disagreeable, but it is this disagreeableness which we ought to call the feeling, not the pain which we dislike. We may also dislike a noise or a smell, but we do not call the smell or the noise a feeling. Our liking and disliking will interest us when we speak of the personal interests,

but as long as we speak of sensations we ignore the question whether we like or dislike them and consider only the content of the sensations. Hence we must say that there are four separate kinds of skin sensations, namely, touch, cold, warmth, and pain. We should speak, accordingly, of eight senses instead of the traditional five.

The touch impression can appear in all intensities from the softest contact to the strongest pressure. The great variety of tactual impressions results from the combination of tactual sensations in space and time. Every merchant and every manufacturer has to discriminate by touch the subtler qualities of the wares. Differences of smoothness and roughness, of hardness and softness, of evenness and unevenness, can be easily detected by the touching finger. Yet they do not really represent differences of tactual sensations as such. It is the same touch sensation which gives us now softness and now roughness, just as it is the same light sensation which gives us now a continuous light and now a flickering one. The flickering light is a quick alternation between light and darkness; the rough surface gives us a quick alternation between touch and interruption of touch. On the other hand the hardness and softness refer to the resistance which the pressure of the finger finds, that is, to the movement which the hand can carry out in touching the object. The subtlest discrimination of tactual impressions is given to the most movable organs of the body, the finger tips, the tip of the tongue, and so on.

Bodily Sensations

We have spoken here only of those sensations for which the source lies outside of the body. But, after all, we have the same kind of message to the brain from the physical world when the source lies in the limbs or in the

trunk of the body. When we move our legs the contracting muscles give us a muscle sensation which is very similar to the touch sensation which the skin furnishes, and surely the pain which may come from a cramp in the muscles from overfatigue belongs in the same class as pain sensations starting in the skin. The psychologist is therefore justified in enlarging the sphere of sensations beyond the mere outer senses. He includes all the impressions which originate in the various organs of the body and which stimulate the little sense organs in the muscles, joints, and inner tissues of the organism. All the pains in a disease, all the so-called organic sensations, hunger or thirst, all the movement sensations from the contracting muscles, from the pressure of joints, from the tension of the tendons, are to be recorded here.

These movement sensations, especially, are fundamental for the organization of our inner life, and we shall soon discover that they are responsible for the whole development and the structure of our experience. No workingman in the factory could perform his task if he had sensations only from his eyes and ears and skin, and did not have sensations from his own muscles and joints. Every movement which he performs sends such a sensation message to his brain and makes him aware of the extent of the movement. It is this group of sensations especially which leads us over to the perception of space and time.

TEST QUESTIONS

1. How does a business man secure his knowledge of the facts with which he deals?

2. Are you familiar with any illusions that occur with reference to the use of our senses? What causes them?

3. Of what practical value is it to understand how our senses produce illusions?

4. How does the psychologist analyze colors? What does he mean by saturated colors?

5. How can a business man apply this knowledge about colors and color combinations to practical everyday use?

6. What physical conditions actually produce the different color effects?

7. How does the structure of the eye modify color impressions?

8. What is the meaning of tone, pitch, and timbre?

9. In what industries is a knowledge of the touch and smell senses especially important?

10. What is the relation of inner and bodily sensations to industrial efficiency?

CHAPTER VI

THE PERCEPTIONS

Grouping of Our Sensations

If we stand in the office or in the factory or in the market, we are surrounded by visual and acoustical impressions, and even our touch sense and our temperature sense and too often our smell sense may be engaged. Yet it would be a very incomplete description if we were to speak only of the sensations of which we become aware. We see shaped things in definite forms. It is not simply a chaos of sensations, but the impressions come to us in organized groups with space and time and number character. We do not see simply patches of grey and white and black light, but we see a typewriting machine on which each key and each lever has its definite form, and we do not simply hear a noise, but the noise has rhythmical time shape. The perception of the things which surround us and which interest us demands far more than the mere awareness of those masses of sensations which enter into them. Their grouping is essential.

Yet let us not forget that we are speaking so far only about the impressions which we receive from without. In seeing the typewriting machine before me I might easily accredit to the perception more than the mere impression contains. I might fancy that I see that this is a Remington machine and that this part is a shift key, that the typewriter can be used with a two-colored ribbon, and that it is better than the older models. But as soon as we

begin to analyze this knowledge psychologically, it becomes clear that all this is superadded by the mind. It refers to ideas in us which result from earlier experiences with a machine or from hearsay, but nothing of this is contained in the immediate perception of the machine. At every moment we add reminiscences of our earlier experiences to that which we actually perceive. When we understand the words of the letter which we read, we perceive only those forms of the words which would not differ if the language were unknown to us. We perceive a page in Japanese print exactly as well as the Japanese perceives it. The fact that he connects with every sign an idea which gives meaning to it lies outside of the process of perception. We have to consider first only that which we really perceive with our senses.

Space Form of Our Impressions

The chief psychological interest turns to the space form of our impressions, and we may naturally emphasize the space character of our visual perceptive ideas. We have before us a typewritten page. It is more than merely black and white; it is black in a particular order of black points; it is this order which groups the black dots into letters, and only this order is important for us. We need not consider at first the fact that we read with two eyes. We see the shapes of the word just as well with one eye only. We may say that for all flat objects, like a printed page or picture, it makes no difference whether we look at it with one eye or with two. If my right eye alone looks on the typewritten page, the one letter which I am just fixating falls into the center of the retina, a region in which the nerve elements are nearest together and in which the most distinct vision is possible.

At the same time all the other letters of the page stimulate definite regions in the side parts of the eye. The half million retina elements can pick up all the points in the surroundings at the same time. Yet this would mean only that hundreds of thousands of light impressions come at one moment to our mind. What does it mean that we recognize space relations between any two points in this field? The mere manifoldness alone does not give us this idea of distance. When we hear music, many tones may come at the same time to our mind; and yet we do not say that the space distance between two tones is five times larger than the space distance between two other tones. And if a bouquet of flowers brings us several smells at the same time, we discriminate them without feeling that they form a circle or a triangle. Those smells and tones are not grouped in space. Why do we group the lights? Why do we not simply feel that there are a lot of light impressions?

We must introduce here a principle which we shall soon find to be of greatest importance. We referred to it in a general form when we spoke of the nervous system. We said that the purpose of the nervous system is to respond to impressions by actions. Now every light impression which comes to the eyes produces in the brain the impulse to a large number of actions. We are concerned here only with one type of action, namely, the eye movements which are carried out under the control of the visual impressions. We said that only the center of the retina is fit to give us the sharpest discrimination. Everything which stimulates the side parts of our eye appears therefore rather indistinct and vague. We do not see its details. The great function of the brain centers which control the eye movements is therefore to secure such actions of the eyeball as to bring the vaguely seen thing into the fixation

point. Whatever falls on the side parts of the retina awakes in the brain such an impulse that the eye is turned toward it, so that its chances improve and it can be seen in detail. That which is above the fixation point produces an upward eye movement; that which is to the left a left side movement; that which is near to the fixation point involves only a slight motor impulse; that which is far out from the center near the margin of the visual field demands a strong motor impulse.

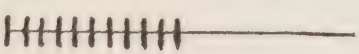
The mere need of getting clear images and of thus bringing everything into the fixation point involves a constant movement of the eyeball. This is performed by six big bundles of muscles which are inserted in the tough white membrane into which the eyeball is packed. These muscles give us slight sensations; we are aware of whether we turn the eye to the right or to the left, up or down, and this is ultimately the condition of our consciousness of direction and distance, that is, of space perception in the plane surface. We see the black ink on the paper distributed in the particular letter forms and perceive these shapes as space distances from point to point, because we need impulses to eye movements in going from one point to another.

Visual Illusions

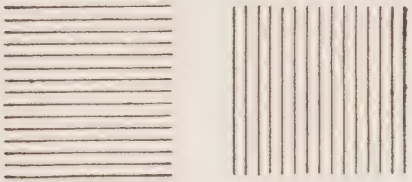
If our perception of distance and direction depends upon the extent and character of our eye movement responses, it is to be expected that illusions will occur whenever these movements are re-enforced or diminished. In practical life we often compare an empty space with a filled one. The filled one appears larger. For instance, the empty distance between two points appears shorter than a dotted line of the same length. This is natural, because in the case of the empty distance our eyes fixating

first at the one end point can move in an undisturbed, simple eye movement to the other. But if we have the dotted line, the eyes make jerking movements from one point to the next throughout the series, and this involves a summation of movement impulses which gives the impression of a bigger space.

OPTICAL ILLUSIONS

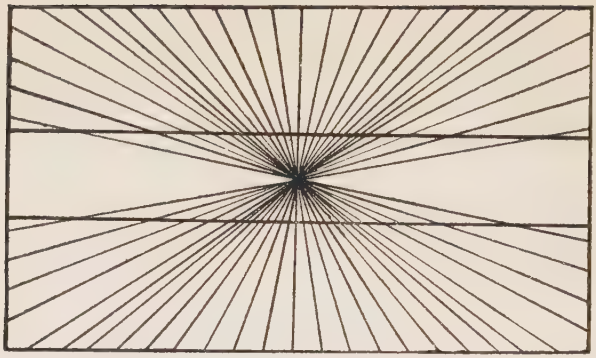


A. The divided half of the line appears longer than the undivided.



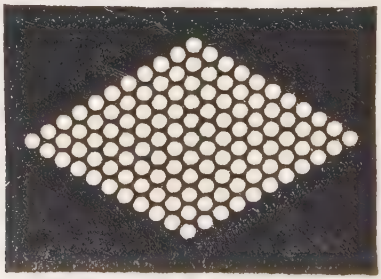
B. If the square is filled with horizontal lines, its vertical dimension appears larger than the horizontal; if it is filled with vertical lines, the horizontal appears larger than the vertical.

C. The straight line which passes obliquely behind the double rectangle does not appear straight.

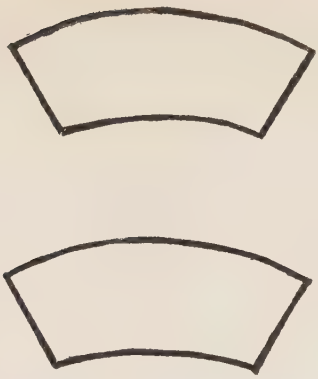


D. The two parallel lines through which the oblique lines pass appear bent outward.

E. The circle appears bent inward where it touches the corners of the square.



F. The little circles appear to be



G. The lower figure appears larger than the upper, while they are of equal size.

The psychologist knows and accounts for numberless, often troublesome, illusions of that kind. Small angles are overestimated, straight lines appear crooked, forms appear distorted, whenever the special conditions suggest too strong or too weak an eye movement. The eye sweeps more easily in the horizontal direction than in the vertical, because the attachment of the eye muscles to the eyeball demands a very simple action for the right-left movement, but a rather complex one for the up-down motion. The result is that the latter appears a little more difficult and therefore a vertical line appears longer than a horizontal one of the same length.

We have no right nor can we afford to ignore these illusions in daily life. The artisan and the engineer, the architect and the draughtsman, have to count with them at every step. Even the light intensity may influence these eye movements. Strong light stirs up stronger impulses to motion than faint light. The result is that the white object appears larger than the dark, the hand

in a white glove, larger than in a black glove. We have that impression even when no comparisons are possible; for example, a room with a light wall paper appears larger than one with a dark one.

Perception of Distance

It is interesting to see how this same principle of movement influence is effective also when not the seeing of the plane surface but the perception of distance from the eye is involved, that is, nearness or farness. Of course we often decide whether an object is near or far from us because it appears large or small. Moreover we rely on the perspective and on the shadows. We have a certain help also in the activities of the lens in our eye. The nearer the object, the stronger must be the tension in our lens in order to get a sharp image, as through the increased tension the lens becomes more strongly curved and adjusts itself to the greater narrowness of our visual object. By far the most important condition for our seeing, whether things are near or far, lies in the working together of our two eyes. We have said that we can read a page just as well with one eye as with two. But whether the wheel of a machine in the factory at which we are working is nearer or farther demands our seeing it with two eyes, and if one of our eyes is covered, we may at any moment easily catch our hand in the wheel, because we cannot judge the distance correctly. But when the two eyes work in harmony we are able to discriminate the subtlest differences of depth and distance. Even if two trees stand several hundred feet away from us, we can still discriminate whether the one is a few feet nearer to us than the other.

The reason for this is that the two eyes see the objects

from two different points of view. The two images in the two eyes are therefore never exactly the same, unless the object is simply a plane surface. If I look at a picture my two eyes see everything alike, as the distance between any two points must appear equal from the standpoint of the right and of the left eye. But if instead of looking at a picture I look at the head of a man with whom I am talking, my two eyes get very different images. The distance from my friend's nose to his left ear must appear to my right eye much greater than to my left eye, as the left eye gets a foreshortened view. Thus I have two different images, and they would produce double images if nothing else happened. That is, if I fixate his left ear, turning my eyes so that his ear falls into my two fixation points, then the picture of his nose would fall on two not corresponding points in my two eyes, and I should therefore see my man with two noses. This is actually the case if I fixate his ear sharply.

But in practical life we never do that. We always perform eye movements by which we bring everything which interests us into the fixation points of the two eyes. Instead of seeing the nose double, we quickly change the convergence of our eyes and look toward our man's nose. Now his nose appears single, because it falls in both of our eyes on the corresponding fixation point, while his ear would now appear double if we were to give attention to it. In other words our eyes are constantly moving in order to avoid seeing double. We want to get one impression only from the single objects of the outer world and to secure that we must continually change by eye movements the convergence of the eyes; that is, we must perform movements in order to get distinct vision from objects which lie at different distances from us. What-

ever is near to us demands that we bring the eyes nearer together. The further distant the object, the less the convergence. If we look at a star, our eyes look out entirely parallel. Every distance is thus characterized by a definite impulse for the moving together of the two eyes. Hence we have here too the eye movements as conditions for our feeling of depth. The seeing of near and far is then just as much dependent upon the muscle action of our eyes as the seeing of right and left or up and down.

Space Perception in Various Parts of the Body

Our space perception is not confined to our eyes. Our fingers do not receive only scattered touch sensations, but furnish us too the ideas of definite forms. The workingman in the factory in his routine work relies on his tactual space impressions no less than on the visual. But we may discriminate between our active and our passive perceptions. In the one case we become aware of a tactual distance by performing a movement. We measure the length of a table by moving the tip of the finger along the edge. The tactual impression remains the same, but by its combination with the muscle sensation from the moving arm we build up the idea of the table's length. In the passive perception our hand or arm may remain at rest, and we become aware of a distance by being touched at two different points of the skin. But it is very characteristic that this power of our skin to discriminate two points at a special distance from each other is very differently developed at various parts of the body. A few simple experiments prove the point.

If we take a compass with the two points at a distance of a twentieth part of an inch, the tip of our forefinger

can discriminate the two tactual impressions, and so can the tip of our tongue or the inside of the lips. But if we put the compass on the back of our hand, the two points appear as one only; we do not notice the distance. The two ends of the compass must now be put a third of an inch distant in order to be felt at two different places, and if we touch the shoulder the distance of the two points must be perhaps a half inch and on the back perhaps a whole inch. But it is evident that the back is less movable than the shoulder, and the shoulder less movable than the arm, and this less than the hand and this less than the finger. We have the subtlest space discrimination in the most movable organs, a fact which is full of consequences for all kinds of manual work. It indicates in a new form that our space judgment is intimately related to our motions.

Localization of Sounds

Our localizing of sounds confirms this truth. If we hear a whistle sounding from the right or from the left, we are never mistaken. But if it sounds from behind we just as often take it to be coming from in front, and if it sounds in front of us, we often believe that it comes from behind. The direct cause is that when the sound comes from our right side, our right ear gets much more impression than the left, and we should never confuse it with the sound from the other side. But if it comes from in front or from behind, both ears get an equal amount of sound, and we are unable to know which is which. Yet we do not know anything of this different distribution of sound in the two ears, and that alone would not give us any consciousness of space. We hear only one sound and

do not know whether we hear it more in the one or more in the other ear.

The decisive factor is that this excitation in the two ears produces a definite movement reaction. As soon as the right ear gets more sound than the left, the brain sends out an impulse to move the head toward the right. It is a natural response to turn the head toward the source of the sound. We learn to ignore that impulse and to keep the head at rest, but the brain impulse toward such a movement exists nevertheless, and it combines with the sound. The whistle appears as coming from the right, because we hear the sound together with the movement impulse of the head toward the right. In short, whether we rely on our eyes or on our skin or on our ears, the world is to us a world of shape and order and form because we respond to the impressions by our movements.

Perception of Time

This same influence of our own bodily responses can be traced in our perception of time. Our knowledge covers the whole stretch of time far beyond our personal memories and expectations. We can think of past centuries. But this thinking of long stretches of time would be meaningless to us if we did not know some bits of time from our direct experience. If we hear the clock strike, we notice that the time between any two strokes is equal. If the last stroke comes a little too late, we feel at once that the time is longer. Here we have really an immediate awareness of the passing of time. Take the case that we hear a signal, after half a minute a second signal, and a third one after fifteen seconds; we can easily notice that the second interval is shorter than the first.

What have we noticed? Nothing happened in those intervals. How can we become aware of the empty time between those signals? But anyone who tries to make such an experiment soon discovers that the intervals were not really empty. It is true nothing happened from without; no sound, no sight may have broken in. But very much did happen in our body, in our muscles and joints; and we became aware of it. When we heard that first signal, a general tension resulted in our muscle system, a tension which helps us to turn our attention to the sound. As soon as that first sound has gone, a relaxation follows; and now we wait for the next sound. This waiting brings a new tension, which after a short while may be relieved again, and so we feel an up and down, mostly together with our breathing movements in the organism. At a certain point the second signal breaks in, and then we have an idea of the whole interval from the total combination of the sound impressions and the impressions of tension and relaxation. As soon as the new interval begins we imitate this play of our body; we try to go through the same tensions and relaxations. The second interval appears to us shorter, because the last sound breaks in before we have repeated that whole story of bodily sensation. This feeling of tension and relaxation becomes the foundation of our direct consciousness of time.

If we divide any period of time rhythmically into equal parts, each rhythmical unit, for instance, every bar in music, is equal to the other, because each time we pass through the same tension and relief. From these short time intervals which we perceive directly we can build up the whole system of our time. As soon as we have to do with longer time intervals we have no possibility of

direct experience, but then we rely on the idea of the contents which filled the time. Looking backward one week appears to us longer than another week, because there was more content. We had richer and more manifold experience. A month of travel with an abundance of interesting and new events appears to us in our memory far longer than a monotonous month in a dreary place where nothing happened. We simply rely on the richness of the material which filled the time.

But it is entirely different with our awareness of the time while we pass through such periods. When we lived through that dreary month, the time passed extremely slowly, and when we had that month of beautiful travel, the time seemed to fly. There is no contradiction. When we are going through a period of time, we feel its passing, as we saw, by our waves of tension and relaxation. If nothing happens, we are constantly waiting for something to come. We are therefore in a perpetual state of tension, and that gives us a feeling of very long time. When our time is crowded with engagements, every moment impresses itself on us by that which we are really doing. Then preparatory tensions do not come into our consciousness at all. We live entirely in the outer events and ignore the passing of time. The experience of passing through a full or an empty period of time is fundamentally different from the memory of a past time.

Meaning and Impressions

We see that our impressions of the surrounding world have time and space order alike because we respond to them by our activities, by our movements, by our tensions. Finally we may add that our responses by action, or at least by preparation for action, also furnish mean-

ing to our impressions. We see table and chair, scissors and fountain pen, hammer and saw. Each gives us the impression of a thing, but its real value lies in the fact that it is more to us than merely a physical thing. It has a meaning, a purpose, a value. The chair is something to sit on, the fountain pen something to write with, the hammer something to pound with, and the impulse to these activities interprets the impressions. As long as we do not know how to use the thing, it has no meaning for us. Its meaning deepens with our understanding of the particular use, and its meaning is completely known to us as soon as we master its use, just as even a word which we read or which we hear has meaning for us only if we know in what situation to use it. Our own impulses to action and to the use of things transform the meaningless impressions of the world into a world in which everything has its meaning and value.

Such a psychological analysis of our perceptions must be made by everyone who wants to understand the working of the mind. It is common ground for all psychologies and in no way confined to business psychology. Yet it is evident that the man of practical affairs has an especial interest in giving his attention to this close connection between our impressions of the things around us and our own actions. The material to which his commercial or industrial work is devoted has no meaning and therefore no value in itself. It gets its value only by becoming material for human activities. They furnish the meaning.

TEST QUESTIONS

1. How does mere awareness of a thing differ from the perception of its space, time, and number?

2. Do we get our knowledge of relationships through the sense perceptions or through the mind itself?

3. How do we get our perceptions of space?

4. How does the question of optical illusions interest the business man? Can you suggest half a dozen such illusions?

5. What should a shoe salesman know about optical illusions?

6. How do we get our perceptions of distance?

7. Why would you feel uneasy riding in an automobile with a one-eyed chauffeur?

8. Why does a dull day seem long in living through it? A busy day short?

9. Why does a dull day seem short in memory, while an eventful day appears long?

10. What application do you see of these last two factors in relation to industry?

11. From a psychological standpoint what is the value of a clean factory?

CHAPTER VII

MEMORY AND IDEAS

Memory's Influence on Actions

Whatever our work may be it is never based only on that which we really perceive around us. At every moment our actions are controlled by our impressions together with a mass of ideas, memories, thoughts, which are added to the given perceptions from our own resources. Impressions are related to wider experiences.

The business man sees the letter in his hand and perceives the words with their meaning. But his reply refers not only to that which is actually contained in the written page, but to his whole earlier correspondence with the writer and to his reminiscences of conversations with him. Moreover he must remember all the details of his affairs, the wares he has in stock, his prices, his calculations, his advertisements and those of his competitors, if he is to answer that business letter. He must consider thousands of facts which are available in his memory in order that his answer and decision may be really adjusted to the whole business situation. What he actually perceives is only a small fraction of the world of facts to which he wants to adapt his response. We all move and live not only in the surroundings which we perceive, but in that wider world of facts of which we have knowledge otherwise than by mere perception of our senses. How do we know the facts which we do not perceive?

We may disregard at first the mental products which we reach by mere imagination. That is not true knowledge. Our imagination may sometimes lead us to correct knowledge, but it may just as well bring us to errors and illusions. Later we shall see how important imagination is for every business man, but it is not a source of actual knowledge. For this everybody must rely on memory and on thought, in addition to his perceptions. The manufacturer who discusses the sale of his goods must know what he has to sell. While he discusses the details, he does not really perceive the goods in his stock, as they are not stored up in his office. But first, he remembers the piles which he has actually seen in the storeroom, and second, he can form a conclusion as to the quantities which are heaped up in other parts of his factory and which he himself has not seen. He remembers what orders he has given, he knows with what exactitude his orders are filled, and by mere thought-processes he thus reaches the knowledge that the manufactured goods are really existing, although he has never seen them. It is a pure act of logical thinking which makes him know how much stock is under his roof.

How does this separation of memory and thought look from the standpoint of the psychologist? We said that the remembering of the goods is based on a previous actual perception, but the thinking out of the quantities of goods is not based on actually seeing them before and therefore has nothing to do with memory. This is perfectly true, and yet the psychologist must add something very essential. He must insist that even those products of thought are psychologically nothing but combinations of memory. All the mental elements which enter into such a thought product must be known from earlier perceptions. The thought brings them into new combinations; but no thought, and we may add at once no imagination,

can bring anything into consciousness which is not ultimately a mere reawaking of earlier impressions.

The artist can imagine a new picture, but cannot imagine any color in that picture which he has not seen beforehand. His boldest imagination can work only with those sensations which he remembers, that is, which he has had before and which his mind now reproduces. No thinker can produce thoughts the elements of which are not reproductions of earlier impressions. The business man who figures up the newly manufactured stock which he has not yet seen is getting an idea of it only from the mental material which he gathered before by actual perception. Our memories and our thought-ideas are built up from the same kind of elements and their only source is the earlier perception of the world. In our memory we renew the perceptions of the past in the same order in which we received them; in our thoughts we combine them in a new order; but we can not invent any new elements.

Impression v. Its Reproduction

While we said that our memory is a renewing of our earlier impressions, we must not forget that there remains a difference between the impression and its reproduction. When we remember the man with whom we talked last year, we may see every detail of his face before our mind; we may even have the power to renew in our mind every wrinkle in his forehead, the exact color of his eyes and his hair, and we may even see his necktie. Yet not for a moment do we believe that we really see the man before us. If we were to take our memory-picture for a real perception, we should have what the psychologist calls a "hallucination." Such hallucinations are symptoms of mental diseases. In normal life they oc-

cur in our dreams. The dreamer really believes that his friend whose picture comes to his mind in sleep is present, but when he is awake he would never think that the man whose face he sees in his memory is actually present. If it were otherwise he would be unable to live a reasonable life; he would never know what is real and what not.

In sleep there is no harm in such hallucinations, because the sleeper does not act; he lies without motion in his bed, and it makes no difference whether he knows or does not know that the remembered and imagined surroundings are unreal. But if the business man in his office were unable to discriminate between the visitor who really enters through the door and the imagined visitor who simply enters over the threshold of his memory, he would live in a state of complete confusion. This is the reason why we call hallucinations symptoms of diseases and put the suffering patient into an asylum where he is protected against these dangerous mental tendencies.

For the normal man it is absolutely essential that everything which his memory or his thought or his imagination brings to his consciousness be somehow different from everything which is actually perceived. And yet, as we said, it may contain every possible detail of the perception. Nor have we a right to say that the difference is simply one of intensity. The impressions do not become darker or fainter. If we remember a bright color, it does not become dull in our memory, and if we remember a loud sound it does not become weak. We can remember the faintest sound and the dimmest light; and yet they do not disappear in memory by further decrease of intensity. No, the strength of the impressions remains in memory the same as in the original experience. The change refers neither to the contents nor to the strength of the impressions. It is a change which has

often been called a "change of vividness." The place or face or speech which we merely remember is less vivid, less real, less striking, than that which we actually see or hear.

If we relate these facts to the brain processes, we should say that all our remembering is a renewing of those brain processes which at first are started from our sense organs and which now appear again without being stimulated by the senses. When we really saw a building, every window and every corner stimulated the retina in our eye and this excitation was carried to the rear part of our brain. Exactly these same brain processes are reproduced when we remember the building, but this time the excitation does not come from the retina; it comes from some other brain processes which preceded the memory. The vividness of reality evidently results only when the brain gets its excitation from the sense organs, but when the same excitation originates in the brain itself, the accompanying mental experience is less vivid and less real.

Reproduction of Impressions

The individual differences in the ability to renew earlier impressions are very great. Many people have hardly any power to reproduce visual impressions or at least their visual reproductions are very vague or lack all color. Again others have very small reproductive power for sound impressions. And finally there are many individuals whose visual and acoustical memory is poor, but who reproduce very easily their original movement sensations. In a way, their whole memory consists of memories of actions. The muscle and joint sensations which are experienced during the activities are bet-

ter reproduced by them than the sights or sounds to which the actions responded.

These differences are of thousand-fold importance in the business world, and everyone ought to know how his own memory and the memories of people with whom he is in contact are really working. If the stenographer has to remember a telephone number, it will be best to speak it to her if her memory is essentially acoustical. But it will be well to write it down for her if her memory is essentially visual. And it will be wisest to make her repeat it either by having her write it or say it if her memory is essentially of that motor type. As soon as she speaks or writes it, it has become a set of her own movements, and they will easily reproduce themselves, while the mere sound or sight would quickly fade away.

Laws of Memory

Association

Our memory works in accordance with definite laws. The fundamental one is that each impression or idea calls back to our mind earlier experiences which were connected with it. This connection may have been one of neighborhood in space. A man comes into our office and the sight of him awakes at once the memory of the hotel lobby where we met him last year. We saw that hotel background and the man together in space and the two images remained connected. When the one is renewed, the other will follow. If we had again gone to that lobby, it would have reminded us of the man whom we met there. But the contact may be one which is independent of space. The two experiences may simply have come together. The man who enters our office may first of all awake in us the memory of his name, just as

his name might have stirred up the memory of his face. In our original impression we saw the face and heard the name, and they were coupled, or, as the psychologist says, they formed an association. As soon as one of them is renewed by experience the other by the laws of association is drawn into consciousness. In this case the two associated impressions come to consciousness at the same time.

But an association may also be formed if they are immediately succeeding. If the first words of a sentence which we heard are brought back to us, the other words will come to our memory. We can trace in our mind all the stages of a journey. Each experience pulls into our consciousness the memory of the following or preceding one. If we have to perform a complex series of acts in a technical piece of work, the performing of the first act awakes in us the idea of the second, and the performing of the second stirs up the memory-picture of the third.

The association of ideas is not confined to such cases of immediate neighborhood in space and time. The man who enters our office may be entirely unknown to us. We never saw him before. Yet he reminds us at once of an old acquaintance the memory-picture of whom rushes to our consciousness. This man before us and our friend of whom he reminds us were never together in our experience; and yet the sight of the one recalls the other simply because they have similarity to each other. But what we call similarity is ultimately only a community of parts. In the mental pictures of the one and the other man there must be something in common. Otherwise we should not call them similar. Everywhere we speak of similarity only if the two objects share some elements. They may be elements of the content or elements of the form. But if this is the case, then this association by similarity ap-

pears in a new light. It too can be reduced to a mere being together. The common features are in the one impression together with one group and in the other impression with another group of sensations. The nose and the eyes of the man whom we see entering were together with an entirely different mouth and chin and forehead in our acquaintance. They are together with one set of features in the one face and with another set of features in another face. They bring back the picture of the other man simply because they were together with those accompanying features in the earlier impression.

Similarity is a rich source of our memories, but it does not introduce a new principle; it is an association based on the earlier being together of the parts. In other words all associations are at bottom nothing but the returning of that which in an earlier experience was connected with the present impressions. In a good memory those connected impressions respond very easily; in a poor memory they are awakened with difficulty, but no memory is equally good or bad in all directions. A memory may be excellent for faces and names or funny stories and yet very poor for numbers or places and perhaps entirely defective for melodies.

REPETITION, FRESHNESS, AND IMPRESSIVENESS

But it is not sufficient to understand that all remembering is based on the reawaking of the experiences which were connected in earlier impressions. Our mind would be a chaos if everything rushed into it which ever was connected with our present experience. If we looked into our room and everything reminded us of everything else which was ever linked with it, if every chair reminded us of the place where we bought it or of the people who have sat on it and of all possible chairs which have similarity

to it, from every single impression a whole avalanche of memories would break into the field of our consciousness. Yet we all know that only a few memory-images appear at any one time. A selection must occur. At every moment most of the material which we might remember remains outside of consciousness and only a few associations are admitted. This selection is not one of our own conscious effort. It goes on without our knowing it, and we can easily find the causes which control it.

It is first of all the frequency of our earlier experiences. The more often two impressions were together in our mind the greater is the chance that later the return of the one will awake the memory of the other. But even every school-child knows that there is one method still more reliable for the moment than frequent repetition, namely, the freshness of the connection. The school-child looks quickly over his lesson just before the examination begins. He knows that that which has just preceded will be ready for reproduction in his mind. Finally those connections are favored which made a deep impression on us, which gave us a special joy or pain or attracted our attention strongly or gave us a shock.

The traveling salesman who wants to be sure that in his talk with his customer all the facts concerning his wares and their prices and the ways of shipping are perfectly at his disposal, must try to profit from all three ways to help the memory. He must have frequently studied the material and connected the wares with the prices. If he has repeated them well, he can be sure that they will be at his disposal at any time. The mere repetition has improved those brain connections. The nerve paths in which the excitation runs over from one group of brain cells to another offer less and less resistance the more often they are used. But our traveling

salesman will profit just as much from going over his notes quickly before he makes his visit. What he looked over may be very superficial in his mind, and the connections may be so loose that they will be forgotten tomorrow, but at first these recent impressions have so much energy in his brain that they are still more easily reproduced than that which has been ingrained by frequent repetition. And as to our third factor, our traveling salesman will surely not forget those goods and prices with which an unusually high extra commission for him is connected. The idea of his own advantage with its strong emotional pleasure has forced this particular connection so fully upon his mind that he will certainly not forget it.

SELECTIVE POWER OF MEMORY

Yet we must consider one other aspect. The repetition, the freshness, and the impressiveness of our memory material may well explain why certain facts are better held in our mind than others. The street address which we have read on letter paper many times will be firmer in our mind than one which we read only once. The address which we read this morning may still be present, while that which we read last week has faded away. And the address which was strongly impressed on us by being heavily underlined will stick to us better than that which came inconspicuously. Yet these three factors alone cannot explain to us which ideas actually will enter our mind. We must consider a further feature of the situation.

Our memory never stands under one influence only. Our mind is never a blank in which only one impression or one idea exists and in which accordingly one content alone starts the memory-ideas. We always have a large number of impressions or ideas in our consciousness, and

all of them work together. The memory-ideas which really appear are those which are stirred up by all the ideas present at the same time. The whole situation, the whole background, influences the choice of the memory-ideas. Our memory does not throw into our mind all kinds of fresh or frequently repeated or impressive material which happens to be somehow connected with a name or a phrase which we hear or with a thing which we see. But it selects among them only those ideas which are appropriate to the whole situation. We have ideas of the situation in our mind and they all work together in strengthening that memory material which is related to all of them. Our memory is a great selective agency. We do not select the memory-images by a conscious effort, but the ideas present in us secure this selective effect by their own mutual influence. Hence we can trust our memory not only to be ready to furnish us with material but to sift the material before it comes to our knowledge.

The Memory Process

Where did those memory-ideas remain in the meantime? Where are the names and dates and all our knowledge stored up until the memory brings them to our consciousness? Psychologists dispute much about this problem, and they are grouped in two large camps. The one party says all those ideas are in the unconscious, or, as some like to call it, in the subconscious mind; that is, they are somewhere in the mind but not in the conscious mind. In the other camp it is claimed that the ideas have existence only when they are in consciousness and that before their appearance in our conscious experience they do not exist at all as mental ideas. What does exist is a certain disposition in our brain cells. We see the room

around us because it stimulates our eye and through our eye our brain cells. Thus our perception was not somewhere in the mind before this stimulation of our brain. The same holds true of the memory. The brain cells become excited, this time not by the stimulation of the sense organs, the eye and ear, but by a stimulation from other brain centers. The memory-idea arises exactly as in the case of perception entirely new through the action of the brain cells. The experiences of yesterday exist in us then not as subconscious ideas but as physical dispositions of our brain cells to go through that same action which they passed through when we saw and heard and touched the world of yesterday.

This dispute, however, hardly concerns the man of practical affairs. The salesman who wants to rely on the stored-up knowledge of his business details has really no interest to know whether those figures or firm names exist in him as unconscious ideas which he can call to consciousness or whether they are dispositions of his brain cells which he can awake to that brain activity which is accompanied by conscious knowledge. For his practical purposes it is entirely indifferent which theory is accepted. Either is indeed nothing but a theory, and it is therefore misleading if the popular literature on practical psychology usually puts overmuch emphasis on the defense of the subconscious mind. This idea of the subconscious mind appeals more easily to the public which is inclined to seek interesting secrets behind the cover of the unconscious, while the theory of the brain dispositions is in better harmony with the scientific facts. For the man of practical interests it is sufficient to understand that all our experiences leave traces in us from which conscious memory-ideas can arise. Whether these traces are mental ideas below the surface of conscious-

ness or whether they are states of the brain cells is to him of no consequence.

Abstract Ideas

Instead of the actual memory of special things we may have general ideas, abstract ideas, of the contents of the world. If I speak to an audience of a hundred persons and I say something about the lot of the workingman, every one of the one hundred may have a different kind of worker in his mind. One thinks of a textile worker and one of a metal worker, one of a mason and one of a plumber, one remembers a single man whose face impressed him and another thinks of the picture of a whole mill with hundreds of laborers. Yet, whatever the chance pictures in the mind may be, all the hundred people have the same idea in mind. The one in whose consciousness the idea of textile workers arises has the same general idea of workingmen as the one who thinks of the plumbers, simply because both know that the idea which they have in mind is more than that chance picture which the memory awakes in them. They all feel that any number of possible memories could be substituted. The content of their mind upon which the understanding of the sentence depends is not a concrete idea but a general idea which embraces every possible case.

With the help of such general ideas the mind can bring together the material for new and complex thought. If we hear the sentence, "The wages of the workingman are dependent upon supply and demand," each of the words is such a general conception, which involves unlimited possibilities. But by their special combination one definite thought is awakened in consciousness. Each of those words arouses in the mind only those elements which fit together with the other words, and they are

then combined into one simple unit. Only by such use of words can the content of our mind endlessly surpass that knowledge which mere perception and memory furnish. Each word becomes the central point from which numberless relations irradiate. All our previous experiences are condensed in such general combinations of ideas.

Yet the mere ideas which the single words suggest are in themselves not knowledge, because a mere general conception does not express any truth. I can have the conception of the "wages of the workingman" and the further conception "dependent upon demand and supply," and yet I may have no facts expressed by them. They become the representation of real facts only by adding the word "are"; that is, by claiming through that word that the one and the other stand in that definite relation. This repeats itself everywhere. To think three plus five or to think of eight or to think of nine is not knowledge, but to think that three plus five is eight and that three plus five is not nine is real knowledge. The connecting "is" or "is not" transforms our mere having of ideas into a real possession of truth.

But what is the mental content which is expressed by the "is" or "is not"? That is not a mere image. No, it is an action of ours, an action by which we affirm or deny reality of the content. Every thought contains such an element of our personal approving or disapproving, affirming or denying. We insist that two contents of our mind belong together or do not belong together. We call such a thought a "judgment." As soon as we have two judgments we can proceed in the same way and can affirm or deny that these two judgments belong together, and so we can come to a new judgment; and that we call "reasoning." Through this method we may enlarge the

circle of our true ideas so that it includes any knowledge of the world, everything which science and scholarship and life experience can furnish. But whatever we know of our personal affairs or of our surroundings or about the universe is in our consciousness composed of the sensations and reproductions of sensations and is held together and formed into units by our personal reactions and by our acts of affirmation and rejection.

TEST QUESTIONS

1. What part does memory play in answering a business letter?
2. Is imagination a source of knowledge?
3. What is a hallucination?
4. As a practical proposition, why is it important that actual impressions should be more vivid than memory-images?
5. What are some of the factors to be considered in memory-training?
6. How do we acquire abstract ideas?
7. In what way do our experiences contribute to our general ideas of the world and its affairs?

PART THREE — INTERESTS

CHAPTER VIII

ATTENTION

The Nature of Reality

We have traced the upbuilding of knowledge in our mind. We recognized that this involves more than a mere passive state of mind. Consciousness is not only like a photographic film on which the picture of the world is thrown. The contents of our mind which we call knowledge, that is, which involve a possession of truth, demand, as we saw, not only impressions but our personal reactions. Even a memory-image becomes a real truth to us when we affirm that what we remember stands for that which happened in the past.

But whether we have to deal with perceptions or with memories or with judgments and thoughts we are personally bound in our reactions, if we are really aiming toward truth. We cannot arbitrarily change anything; we do not feel free. Certainly it is an act of mine by which I affirm the memory-image of mailing my letter last night. I may now regret that I did mail it, but I am powerless to change the truth, that is, I am bound to link just this memory-image with the real facts. But we are not only bound to affirm our memories; we are no less bound to affirm our correct thoughts. If I sum up my credits and sum up my debits, I may wish that my calculation would bring a better result; but while all this is

my own acting and my own doing, yet I am entirely bound and have no freedom to replace the unwelcome figure by a better one, if I want the result of my thought movement to be true.

The possession of truth demands our activity, but we are entirely bound in that activity. As soon as we proceed according to our fancy, we have left the realm of knowledge. The world of facts forces itself on our mind and demands that we act in complete submission to stubborn reality.

Our Relationship to Reality

Yet in the midst of this world of facts we stand as personalities with our personal interests. We have to live our individual lives. Our aim cannot be to know the whole truth, that is, to know everything which ever occurred in the universe. We need knowledge only of that which concerns us and that which has immediate contact with us and serves our aims and ends of life. Our perceiving, remembering, and thinking in which we appear so entirely passive in obedience to the laws of truth must be brought under the control of our own interests, which sift that which refers to our needs from that which is indifferent for us. We cannot change the truth, but we can sift the truth, selecting those parts of the truth which we must consider if we are to fulfill our tasks. The workingman must know the details of the machine at which he is working. To know with the same accuracy all the other machines in the country would certainly be additional true knowledge, but it would not help him in the least in earning his wages.

The banker surely must have a much wider outlook. He must know not only the contents of his own bank books, but he must know many facts concerning the national and

international market; he must know the men with whom he deals and much about industries and resources. Yet even that which he knows is not the trillionth part of the truthful knowledge which he might acquire. While he knows something of the economic facts, he has never studied Egyptian history or differential calculus, and he does not even remember any longer the advertisements over which his eye glanced in last year's newspapers. In short, from the immeasurable quantities of possible true ideas he too and everyone controls by his special interests the selection of the material in consciousness.

This brings us to the second great group of processes in the mind. The first contained everything which secured the acquisition of knowledge; the second must contain the acts by which the contents of consciousness are selected. In the first group everything depends upon the experiences from without; in the second everything goes back to the actions from within. There we had to do with the surroundings and here with the personality.

Nature of Attention

The great means of the mind for this end is the mechanism of attention. The attention is the central power by which we admit some material and eliminate all the rest. We are occupied by a problem; its details absorb our attention; all the hundred other engagements are forgotten for the time being. We are writing a letter; all our thought is centered on its content. We may ignore even the conversation around us; we may not hear the noise from the street; we may be unaware of our plans for the rest of the day; everything is removed from consciousness and only the question about which we are writing controls our mind. We must consider the various features which are involved in such an act of attention.

The aim of every process of attention is to get a stronger hold of the object before us. We want more insight. If it is something which we see or hear or touch, we want more detail, more clearness, more understanding. If the object is a thought, an abstract idea, we want to get more of its connections and of its whole setting; we want to draw its consequences, that is, again; we want to grasp more of that which is contained in it. If we give our attention to a memory-idea, we want to trace everything which belonged to it in the past. Our attention is always an inner activity. It prompts us to go beyond that which we possess at the moment, to want to grasp more of it, or to want, at least, to secure its uninterrupted continuation.

This activity may be entirely spontaneous, that is, it may result from our own inner wishes and ideas. Or it may be called out by the needs of the situation. In the first case we speak of voluntary attention; in the other case of involuntary. If in a group of men before me I single out one because I have a question in mind which he is to answer, I turn my attention to him because my own idea makes me do so. But if in that group suddenly one turns to me and indicates by gestures that he wants to speak to me or begins to address me, my involuntary attention is drawn to him.

The Four Attention Processes

VIVIDNESS

The act of attention may be said to consist of four different processes. First, the object to which we attend becomes clearer and more vivid in our mind. This must not be confused with a change in the strength or intensity of the impression. A color does not become

lighter, a tone does not become louder, a figure does not become larger when we turn our attention to it. The change is exclusively one of impressiveness. The whispered word, if it attracts our attention, does not grow in strength, but it takes stronger hold of our mind in spite of the fact that it remains much less loud than other words spoken around us to which we do not listen. As soon as this increase of vividness and impressiveness is going on, the details stand out from one another and therefore everything becomes clearer. The more concentrated our attention, the more sharply do we recognize the differences between the various elements.

EXCLUSION

But this increased impressiveness, vividness, and clearness of the attended object in our mind always goes together with the second feature, which is no less essential. It is a negative one. The ideas not attended fade away and lose their impressiveness. To be sure, the workingman can feed his machine with perfect regularity, and yet his thoughts may wander. While he makes his regular arm and foot movements he may think of his family or of politics. But this is possible only because the whole act has become mechanical, or, as the psychologist would say, automatic. He does not really give his attention to the movements which he performs. If some hitch suddenly comes in the machine, he must give his attention to it and at that moment family and politics fade away and disappear from his consciousness. The object of attention does not allow the presence of anything which interferes with its first rights.

This negative change is exactly the opposite of the positive change of vividness. It is indeed a decrease in vividness and in impressiveness only. It is not a decrease

in strength. If we write a letter while the noise of the factory is around us, the noise does not in the least decrease in intensity. Its strength remains the same, and only its impressiveness on our mind has gone. It has lost so much in vividness that we are not even aware that it reaches our mind at all; and yet if the noise of the machines were suddenly to stop or even to become weaker we should notice it at once. The technical term for this suppression of the material which is not attended is "mental inhibition." This inhibition can pass through all degrees. We may even become unaware of a toothache if we are fully absorbed by the startling telegram we just received.

Where the demarcation line lies between what we attend and what we rule out must depend upon our personal motives. When I enter a mill in conversation with the manager who shows me the establishment, I may be so absorbed by the sight that I inhibit the words which he is speaking, that is, I am inattentive to his conversation, while the room as a whole impresses itself vividly on me. In the next moment it is only one particular corner of the room in which a few girls work around a table which becomes impressive and clear in its details, while all the rest of the room loses its vividness. One instant later even that whole group may lose its hold on my mind and only the face of one girl attracts my attention and the whole room and all the conversation may be lost.

How much or how little we are to welcome and to reenforce and to make vivid can be decided by us beforehand. An illumination engineer who is interested in street lanterns may travel through all Europe and bring home from his trip nothing but the memory of different lighting systems. Whatever cities and streets he passed through, he gave his attention only to that which he

wanted to see, as that alone had importance for his purposes. An architect might have returned from the same trip without any memory of the lanterns but with most vivid ideas of the fronts of the buildings. A dry goods importer, on the other hand, might have ignored the buildings and the lights and seen only the gowns of the people on the street. We can set our attention beforehand and only those objects for which it is set will come to their strongest impressiveness and clearness, while everything else remains to a certain degree inhibited. We shall speak later about the individual differences in that respect, but fundamentally everyone can prepare his attention and thus secure a mental state in which certain impressions or ideas or memories become re-enforced and others excluded.

TRANSITION TO ACTIVITY

The third feature of the act of attention is the transition to activity. As soon as we focus our attention on something in our surroundings we are ready to act in response to it. All our movements become related to that impressive object, while those neglected and inhibited impressions are no longer starting points for any action. This is not accidental. On the contrary, as soon as we examine the case more carefully, we discover that this readiness for action is intimately connected with the increase of vividness in the attended and the decrease of vividness in the not attended ideas. This connection is full of importance for our whole mental behavior and to understand it well is an essential condition for true control of our mental life in the interest of our practical tasks. The situation is this: The vividness of the impression or idea is itself dependent upon our readiness to act in response to it. An impression takes hold of us

if we are prepared to act toward it, and an impression remains reduced in its vividness and does not take hold of us if we are unprepared to act, if it finds no response in us. Our preparation for action or suppression of action becomes in this way a preparation for the re-enforcement or the inhibition of the impressions themselves.

Our preparation for that which we ourselves are to do is decisive for the impressions which the surroundings will make on us. Our readiness to write a letter makes those ideas which we want to write impressive in our mind. Then the chance impressions which our eye could get through the window do not take any hold on our mind. But if we prefer to look out of the window and are prepared for that set of movements, then the ideas needed for the letter-writing will fade away in our mind and any chance happening on the street will attract us, will take hold of our consciousness, and our whole attention will soon belong to the snowballing boys on the street, while the letter at our desk is forgotten.

Only from this point of view do we understand that the increased vividness of some contents of the mind is always connected with the decreased vividness of the other contents. The actions are responsible. We cannot perform two opposite actions at the same time; we cannot write the letter and look out of the window; we cannot sit down and stand up at the same time; nor can we turn to the right and to the left, or open our hand and close it. Whatever action we perform must exclude the opposite action. The structure of our organism demands that. All our muscles are arranged in pairs. The biceps of our upper arm bends our arm, the triceps stretches it, and the mechanism of our nervous system is so arranged that if the impulse goes to the one, the nervous path of the other is closed.

Now we can understand how everything hangs together. As soon as an impression or an idea comes to our mind which finds the paths for action open, this idea becomes vivid and impressive and leads really to the action itself. But as soon as the impulse to the action is developed, the path for the opposite action becomes closed, and as soon as this opposite path is blocked, the vividness of all the impressions and ideas which would demand action in this blocked path becomes decreased. They fade away. The shading of the world is thus dependent upon our readiness and unreadiness for action. Every new ability to react and to respond by our movements opens to us new fields of interest. The tool which we know how to handle and which we are prepared to use enters into the focus of our attention; the one which we do not know how to use is an indifferent impression which we ignore.

FEELING OF ONE'S SELF IN ATTENTION

We may add only one feature to the study of attention. In every act of attention we feel ourselves. The things which we see and hear or which memory carries to our mind but which remain indifferent to us go on in us too. But we do not feel active in them. Only when we fixate something in the visual field, or listen to something in the sound world, or concentrate our mind on a remembered event, or devote our thoughts to a problem, do we feel that we ourselves are active. But this stands in nearest relation to the fact which we have just discussed, namely, that the attended content of mind becomes the starting point for action.

As far as the outer world and its objects are concerned the first action is of course the adjustment of the body to the impression. For instance, we cannot give attention

to something which we see without turning the eyeballs so that the attended object falls into the center of the two retinae, that is, on the fixation points. It needs much training to give attention to something which falls on the side parts of the retinae. The natural tendency is to fixate the attended object, to turn the head to the source of the sound, to strain the muscles of the arm if the finger touches the object of attention. Moreover the whole body enters into a state of tension, as that alone secures the steady position of the sense organs on which we can gain the strongest impression. Even the breathing becomes more regular and somewhat artificial from this general tension. The muscles of the forehead become contracted. These movements, helpful to the purpose of getting the greatest amount of impression, bring the feeling of our own body into prominence, and this feeling, composed of many movement sensations and tension sensations, makes us aware that we ourselves are actively engaged in the process of attention.

How to Secure Attention

We said that the chief motive for the direction of our attention is our preparedness for reaction, and this is controlled by our training and our present ideas. We see in our surroundings that for which we have set our mind. We did set it by preparing certain reactions. But this does not exclude the strong effectiveness of the outer conditions. We may not have prepared for a definite action. Then we are ready to enter into any response. Not everything will be equally fit to awake our reactions. The sudden stimulus, the very strong impression, the unusual occurrence will be more effective than the slow, the faint, the customary happening. No one can help giving his attention to the sound of an explosion in his

neighborhood. The mere strength of it seems to break open the paths for reaction. But whether the noise of a banging door still really attracts our attention or not will depend upon the habits in our office.

While it is true that the customary has little power to stir our attention in comparison with the unusual and startlingly new, we must not forget the opposite, namely, that just the familiar in a strange surrounding must draw our attention most of all. A face which we know holds our attention when it appears in a crowd of strangers. All the unknown faces remain indifferent, because we are not set for a reaction. The one which is connected with our earlier experiences releases reactions for which we are prepared through our earlier acquaintance and this readiness to respond gives to the impression its accent in consciousness. It becomes vivid and enters into the center of our attention.

This leads to a very essential point. Attention can be drawn by breaking into the mind, by startling effects of newness, originality, glaring, loud impressions, and what-not. And yet the safest way and the most effective is that which makes use of the existing dispositions for action. Whoever appeals to the personal experiences, to the habitual inclinations, to the natural interests, to the well-trained responses of a man will draw his attention and, above all, will hold his attention much better than he who starts with entirely new appeals. I can force myself on anyone's attention by suddenly shouting to him, but he will not go on listening to me if my remarks cannot touch levers of natural interest in him and do not refer to anything which makes him internally respond. The larger the groups of associations which my arguments stir up, the greater the chance that his attention will remain with me. Each of those associations is a

starting point for possible action, and all those wide-open paths for reactions will secure in his mind vividness for every word which I speak.

How to Hold Attention

The holding of attention is indeed very different from the mere awaking of attention. We saw that we are attentive only as long as all the ideas which would lead to opposite action are inhibited and suppressed. But these ideas suppressed for a moment are soon growing in strength. They push themselves into consciousness and they will get the more chance the less their rivals can really hold our attention by new appeals. The result is the fluctuation of attention which is characteristic of every mind. We cannot keep our attention fully applied to anything for a long time. There are always larger or smaller variations. If we hold our watch so far from our ear that we just hear its ticking and listen with full attention, after a few seconds the sound will disappear. Some seconds later, it will come again, and so it may come and go for a long while. Anyone may try to look at a printed word which interests him. Let him stare at it for five minutes and he will notice that the word begins to crumble, to lose its meaning. He will see only single letters, he cannot keep his attention on the word as a whole word with a meaning. Our attention needs frequent change in order to stir up ever new reactions, as otherwise the opposite reactions would become effective.

We keep attentive in a lecture for a whole hour because it is not one single content which demands our attention but every sentence brings new thought. Yet inasmuch as it is after all one group of ideas only which the lecturer brings before us, even there it may be difficult for us to

fix our attention in the one direction if that one group of ideas does not appeal to our ordinary activities, and the result is a wandering of our mind. Our attention is suddenly turning away from the topic of the address to some home image and to the work in our office.

The opposite reactions have the best chance when the attended impressions begin to fatigue us, especially when bodily fatigue sensations from long muscle work enter the mind. Every fatigue sensation works as a stimulus to stop the work and thus to close the channels of reaction. But we saw that as soon as the channels of reaction are closed the impressions themselves become less vivid, less impressive and finally dull and inhibited. Bodily fatigue therefore interferes with our attention. But also without such muscle work purely mental fatigue has the same effect. As soon as the brain center gets exhausted, it becomes unable to produce the necessary reactions and as soon as the reactions stop the suppressed opposite reactions find their chance. The attended idea fades away and the so far suppressed ideas rush into the mind. We stop being attentive; we are attracted by anything which draws us away.

Application to Business

These simple facts of attention must play a fundamental role in the world of commerce and industry. No work can be done in any realm of human endeavor without concentrated attention. But work along commercial and especially along industrial lines demands continuity of rather equal attention to an unusual degree. The workingman in the mill, the clerk in the office, the salesman in the store, the supervisor in the factory may not have to concentrate his attention with the extreme intensity which a scholar or a lawyer or a physician or a

politician or a minister needs for a particular act. But he has to hold his attention fixed on his work with very little interruption. He himself and, above all, those who plan the work for him and pay him for his services have accordingly the greatest interest to understand the conditions under which attention can be most efficient.

A workingman whose attention is constantly drawn away by irregular or rhythmical noises in the factory, a clerk who is constantly disturbed, will never produce the best possible work. But as soon as the eye of the employer is sharpened for the psychological conditions he will easily discover sources of distraction and friction and irritation which are not so much on the surface.

On the other hand it will be possible everywhere to create positive conditions which will help the attention. In good light, for instance, the laborer or the clerk or the salesman can see the details of his work with much greater ease than in poor illumination; the more detail he sees, the clearer the visual impression, the more easily he starts the correct reactions, and the more eager must be his attention.

But it is not only a question of the outer conditions. We have emphasized that the preparation for action, and that means the previous training and the acquisition of ideas about the work, are most helpful. Nobody can do his best work if he understands it poorly, if he must make too strong an effort to enter into the necessary responses. Moreover we saw that the attention can never be held at an equal level for a long time and that fatigue is always disadvantageous. Thus an alternation between sharp work and light work, between work and recess, becomes essential. Too long working hours, uncomfortable bodily positions, must decrease the efficiency of attention in spite of the worker's best will.

A characteristic demonstration can be found in the statistical tables which show the industrial accidents, especially in relation to the different hours of the day. The accidents may be called to a large extent a consequence of diminished attention. The workingman can avoid the accident if his attention is completely adjusted to the external conditions. As soon as his attention begins to lag he becomes liable to wrong reactions which bring accidents in their train. Statistics show indeed that the largest number of accidents occurs two or three hours after the beginning of the work in the morning and in the afternoon. The detailed figures leave no doubt that the workingman needs at first a certain time for adjustment of his attention, then reaches a good period of sharpest attention and after that begins to get fatigued. But in the last half hour before the end of the morning or afternoon period his attention is once more stirred up by the expectation of the near end. This same fluctuation of attention in long waves can be traced with every continuous worker. The bookkeeper in the office makes in the third hour more mistakes than in the second. It is needless to say that the speed of the work is a most important factor among the conditions which determine the level of the attention.

While fatigue and outer disturbances interfere with the achievement of attention it can be strengthened not only from without by new, intense impressions but also from within by secondary motives, such as hopes and fears. The workingman whose attention may wander when he is paid by the day will hold his attention more firmly to the work of his hands if he is paid by the piece. He is not to be blamed for his apparent carelessness in the first case; he cannot change it. He lacks a motive which whips up the attention at every moment. We shall

turn to these problems once more when we come to questions of actions and of efficiency.

So-Called Monotony in Work

In popular discussions it is always taken for granted that a chief condition of the undermining of attention is the uniformity of work. If a man, whether he is working at a machine or at a ledger, has to do exactly the same thing from morning till night, his attention must be undermined; it must require an extreme amount of effort to go on with the work. The usual consequence drawn is that the work itself must be an intolerable burden and that the monotony, especially of our modern industrial functions, is a source of hardship and suffering in the workingman's life.

We are here concerned with the other aspect, that of attention. The psychologist is hardly ready to endorse that popular view. Certainly change is, as we have indicated, a possible condition for keeping attention alive. Every new impression makes an appeal to our mental system and pushes us to that action which carries the attention with it. But every new impression also, of course, finds friction. It is difficult to go over to something new. Constant change means constantly new effort which exhausts the mental energies. Uniformity of work must therefore have certain decided advantages for the attention.

We said before that our attention is naturally most easily held by that which is familiar to us because then all the responses necessary are prepared beforehand. The impression passes into the channels of the right activity and finds no obstacles in its way. If we have frequently gone through a mental or physical operation, every fresh repetition finds us trained and completely

adjusted to it and as the action can easily result the impression itself remains vivid and is sure of our attention. The mere uniformity is therefore in itself not dangerous to attention and, as we shall see later, it depends more upon individual tendencies whether frequent change or continuity of uniform work is more advisable for the greatest efficiency.

Individual Differences

The individual differences of attention are, however, not confined to a tendency for continuity or change nor have we a right to speak only of men with good and of men with bad attention. Different personalities may be characterized by different kinds of attention which are all equally good, inasmuch as they may be useful for different functions. Some persons have the tendency to concentrate their attention very much, while others are more inclined to a widely expanded attention. Those of the first type will do their best only if they are engaged in work which allows a complete focusing on the one impression or activity at any moment, while the men of the other type may render the best service when they supervise many things at the same time, perhaps divide their attention among many machines or have a large mass of business details to which to attend. Again we find the differences of those whose attention is best held by visual impressions, those whose whole mental mechanism is most strongly impressed by sounds, and those who are most dependent upon movement sensations or tactual impressions.

Application to Selling

The interest of the business man in the problem of attention is not confined to the attention of the commer-

cial or industrial worker. He is no less concerned with the attention of the customer. For the customer's sake he displays his goods in the shop window and in the store; he advertises his wares in the papers and magazines; he gives significant packings to the manufactured goods, and attaches names and labels to his products. But every display and advertisement and label is an appeal to the attention and is worth while only if it succeeds in forcing the attention in the desired direction. To be sure, it would be very rash to deduce the laws of advertising or display simply from the facts of attention. A shockingly ugly display or a brutally vulgar advertisement would draw the attention of the passer-by and of the casual newspaper reader as surely and quickly as a beautiful and harmonious presentation; and yet it would be badly chosen for its purpose. Other mental factors would work against its effectiveness. We shall speak of some of them later.

Many conditions for effective advertising and displaying and labeling are certainly consequences of the laws of attention which we have mentioned. The surprisingly large object will have more influence in attracting the attention of the customer than the small; the full-page advertisement more than the quarter-page. The brilliant light in the shop window will be more effective than the faint; the unusual type or arrangement or phrasing of the advertisement will force the mind of the reader into the desired channel; the multicolored wrapping or the original picture on the outside of the package will catch the attention in the store; the large piles of the same goods will hold the attention where the eye would have swept indifferently over a few specimens.

Movements and sudden changes have an especially strong control over the attention. The quick alternation

of light and dark in the electric advertisements which flash out suddenly are therefore well calculated for the fascination of attention, and those which involve the illusion of movement effects are especially compelling. A border around an advertisement, contrasting colors in a poster, a catchy name for a patented article, may give attention value to the most indifferent wares. But it is not only the impression of the moment which is decisive. The advertiser who repeats his advertisement in the same paper for a long while not only hopes to reach the attention of new readers. His chief appeal is to the old ones. The mind which was reached the first time by a good advertisement may not have been impressed at all. The attention is not focused on it and therefore it is forgotten as quickly as the eye has glanced to the next page. But when the same comes a second time it finds the after-effects of the first. A certain readiness to respond is prepared, the vividness of the impression grows, and, when it appeals to consciousness for the third time, it can reach the climax of effectiveness.

Experimental Investigations

All these questions of advertising and labeling, packing and displaying, can be made problems of exact experimental investigation. If we paste simple advertisements of similar kinds in a book so that each quarter page contains one, and ten persons have to go through that book so that they devote the same number of seconds to every object and immediately after, or after an hour, or after a day, they have to write down the firm names with their advertised articles, as far as they remember them, the experiment shows that the four quarters of the page do not have equal influence on the attention. The advertisements on the upper outer quar-

ter are almost twice as often remembered as those on the lower inner quarter. Every detail of the effect of repetition or of size or of arrangement of the advertisements can thus be statistically determined and the value for drawing the attention be calculated beforehand.

An interesting case, for instance, is furnished by the question of whether it is better to have advertisements mixed with reading matter or not. It seems natural to expect that the advertiser will profit when his display finds space between columns of text, as has recently become the fashion in popular magazines. But the experiment shows that the effect on the attention is greatly diminished when the advertisement is squeezed in between reading matter. We saw that the vividness of the impression is dependent upon the response which we prepare. As soon as we look over a page which awakes the attitude of reading, we are mentally not prepared for that entirely different attitude of taking in the contents of advertisements. The one reaction interferes with the other, and the result is that the announcements on the mixed pages leave a very superficial impression.

TEST QUESTIONS

1. What is meant by attention? Is it simply an awareness?
2. What is the distinction between voluntary and involuntary attention?
3. What are the four attention processes?
4. How do motives influence attention? How do they apply concretely to your own work?
5. How does attention influence one's activities? What practical problems does this suggest for the shop foreman?
6. How may attention be secured?
7. How may it be held?

8. What are some of the most common distracting influences in a factory? In a stenographers' room? Suggest some positive aids to attention in each.

9. What is the relation of attention to industrial accidents? To monotony in work?

10. Are you of the concentrated or of the expanded attention type? What kind of work should you be doing?

11. What are some of the applications of this chapter to selling? To advertising?

CHAPTER IX

FEELING AND EMOTION

Relation to Attention

We have studied the process of attention as the act by which the mind sifts the offerings of the world. Those contents of the mind are attended to of which more clearness, more vividness, more detail, more knowledge of consequences are needed. Everything else becomes suppressed and inhibited. But we must go farther back. What stands behind that mechanism which makes us attend one thing and disregard another? We emphasized the importance of actions. We attend that toward which our action is directed and suppress that which would demand the opposite action. We made much of the importance of our preparedness for a particular action. Yet we have left out the ultimate spring in our mind which is most effective in getting our action and through the action in getting our attention, namely, our feelings.

The Nature of Feeling

We may at first take the word in its widest sense. Then it means the inner states in which we become aware that an experience is harmonious or disharmonious with our self. If it is harmonious we have the feeling of pleasantness, of agreeableness, of satisfaction, of joy, of delight; if it is disharmonious our feeling is one of unpleasantness, of disagreeableness, of pain, of sadness, of torture. We may add at once a characteristic feature. If the ex-

perience is harmonious with our self, we aim toward its continuation or its strengthening and unfolding; if it is disharmonious we try to break it up or at least to reduce it.

If this is the case, we recognize at once the relation of feeling and attention. Every feeling involves an action, this very action to make the experience continue or discontinue. And we see that everything which is an object of our action becomes from this fact the center of our attention. Even the disagreeable impression of which we want to rid ourselves on account of our unpleasant feeling forces itself on our attention and becomes at first more vivid because we concentrate our action on it in order to destroy it. But we must consider the situation in more detail, as surely the process of feeling and its more complex form of emotion stands in the center of our life, and not least in the center of business life. Whatever a man's place in practical life may be he works with the aim to be happy and to enjoy his work and its results and to eliminate the sources of dissatisfaction and unhappiness. Nobody buys and nobody sells but for the purpose of satisfying his feelings.

The Nature of Self

We said every feeling is the awareness of harmony or disharmony of an experience with our self. Hence we must first settle the question: What do we mean by our self? What is our personality? If we say that something is agreeable because it furthers our self, and something is disagreeable because it interferes with our self, we mean, of course, that self which we find in our inner experience. It is not sufficient to characterize it by name and birthday. We must grasp the essential features of the self which we find in our consciousness. It seems the

easiest thing in the world to say what we ourselves are, as we surely cannot know anything and anyone better than our self. It is after all the only thing in the universe to which we have immediate access. And yet it is extremely difficult to determine exactly what we mean by our self.

Surely the idea of our own personality has never been handed over to us as a complete, ready-made possession. It had a long development. The infant does not know anything of himself as a personality. He plays with his own feet as he would with a toy. The idea of one's own personality grows slowly from the sensations which the body furnishes. The child sees and hears and touches millions of things and among these impressions are those which originate from his own organism. He has the muscle sensations and joint sensations from his arms and fingers, his legs and his trunk, and they melt together with the touch sensations of his skin and with the temperature sensations, and as a very important part with the occasional pain sensations, hunger and thirst sensations, tickling sensations, and many others which are bound up with the processes of the body.

Development of Personalities

All these sensations cluster together and form a group which quickly gains central importance. First of all, that group always remains present. Whatever the child may see and hear, however often he may change his surroundings, the sensations from his own body always remain at the center. Moreover the child perceives that his body answers his wishes; his arms and his legs become the instruments for the fulfillments of his desires. The position and the behavior of his body decide which things he will see or hear or touch. If he opens or closes

his eyes, if he turns his head to the right or to the left, if he touches things with his fingers, more and more new objects enter his experience. Finally only his body is the source of pain sensations. If the chair tumbles down, he perceives it but it does not hurt, but if he himself falls he not only perceives it but he feels the pain. All these factors combine in the result that the idea of one's own body becomes the central group of impressions and the most important of all which the world awakes in the mind.

In this simplest and lowest form the personality is the one body which is the cause of our impressions and the means of our actions. But this idea of personality quickly spreads in many directions. We said the body is responsible for the impressions of the individual. If the bodily eyes are closed, no visual impressions come to the mind. It is only a natural step, therefore, to consider all these impressions and ideas of the world as belonging to the body. Our personality is then not only our body but our body together with the perceptions and ideas in it. On the other side the body was the acting instrument. But again this action is controlled by the will-impulses. Hence the personality must be not only the acting body but again the acting body together with the will which starts the movements. The outcome is a richer idea of the personality than the child can really reach. On this level our self is our body, together with our ideas and our volitions which are going on in our body.

As soon as the personality idea has reached this stage, it can easily pass through a number of changes in various directions. The one is an enlargement. If the personality includes everything by which our relation to the world is determined, then we must allow room for a social expansion. Our pocketbook is then a part of our per-

sonality, and so is our name and our position and the whole system of connections with family and society. Whatever is in our service and helps us to release our volitions then belongs to our personality in the widest sense. This represents our social personality.

On the other hand we might concentrate the idea of our personality so that only the essentials are included. In that case it is evident that not our whole body is needed. We do not lose a part of our personality if our hair is cut. Not even our arms and our legs are our real personality. The truly essential part is our brain with the content of our mind. Thus we develop a mental personality as against the social personality. Even here in this content of the mind we can draw the line more or less narrowly. In this mental personality the chance knowledge is not really significant. We do not lose our self when we lose the memory of some of the names and dates which we learned in school. Just as we do not give up a part of our personality when we cut our finger nails, we do not lose a part of our mental personality if we forget the time-table which we knew by heart last year. The central group of mental functions, those which we usually call the character and the intelligence and the temperament, the chief dispositions to act and to think, then remain as the true personality.

Many Personalities in the Self

From this narrowest idea of the self as the center of thought and action to the widest idea of the self as social personality is a long distance, with numberless steps. The idea of our self is constantly changing. At one moment we think of our self as a moral personality for which the character is everything and the physical body something external over which we have control, and at

the next moment we think of our self as just such a physical body. And again in the next instant we think of our self as a social personality in the midst of social surroundings. Every situation must demand a special sorting of the elements which we include in our personality idea. The more we emphasize the mental side and the social side, the more our personality idea must change under the different conditions. Our body remains the same; and yet we feel our self as a different personality in our office and in the club, at our breakfast table and in the theatre, in church and in the political meeting.

In every one of these situations new groups of mental contents and of social relations are in the foreground. Our self is really a different one, because the constant element, the physical body, appears unimportant in such situations, and the mental elements which are decisive are entirely different ones every time. Of course we can secure the consciousness of unity by our memories. The man who sits at his desk in the morning filled with the thought of the business affairs of the day knows that he is the same personality who the night before was in the dancing hall with no other thoughts but flirtation and enjoyment of the waltz. The intellectual and social self-consciousness was entirely different in the two surroundings and their behavior accordingly had also little similarity. Yet the memory-ideas bind them together.

In rare cases of disease we find that these memory connections are destroyed. Then a person loses the consciousness of identity with the earlier personality. The physician calls it a hysterical splitting of the personality. Sometimes one personality exists alternatingly with another, and neither can remember the other. But in normal life, however many phases and variations of per-

sonality a self may pass through, they all are bound together by a distinct remembering, and the result is the unity of personality throughout the development.

But if we have many kinds of personalities in us from the spiritual to the organic and from the organic to the social, the question as to what is in harmony or in disharmony with the personality must also take manifold character. Then the *contrasting feelings of satisfaction and dissatisfaction must result when any of these many varieties of personality becomes furthered or hindered.* The displeasure of a moral pang seems at first not to have anything in common with the dislike of a foul smell or with the indignation over a social affront. But they all are cases of an interference with the personalities, only personalities of very different order.

Laws of Feeling

The most elementary feelings result from a simple stimulus agreeing or disagreeing with the bodily conditions of the organism. The body reacts directly. That which agrees finds in the body a response which works toward the continuation and that which disagrees stirs up the opposite reactions which break off the stimulus. The accompanying mental state with which the impulse starts is the pleasure or displeasure. But if the deciding factor is the agreement or non-agreement with the conditions of the body, it is evident that the pleasure or displeasure depends not only upon the character of the impression but still more upon the state of the organic self. Food which tastes delicious when we are hungry would be indifferent when we are satiated and would taste intolerable when we are seasick. But while it is true that even these simplest feelings depend upon our own status and change with the conditions in ourselves, we surely

must not believe that this means absence of definite laws for the realm of these simplest feelings. They are not arising by chance or in a whimsical way. The world of feelings has its regularities and its laws as well as the world of impressions.

Broadly speaking, every stimulus is pleasant in moderate strength and becomes unpleasant in great strength, and between those two is a certain region of indifference or a region in which pleasantness and unpleasantness overlap. The feelings which are attached to the lower senses, touch, temperature, smell, taste, muscle sensations, organic sensations, are more intense than those connected with the higher sensations of eye and ear. Those lower senses have more immediate influence on the body, while the sounds and colors become influential on us less as single elements than as parts of complex objects which do not interest our bodily personality but which appeal to our higher self. Anything too cold or too hot, anything too salty, or anything with a smell of decay has an immediate importance for our body. It interferes with the existence of the bodily personality, awakes an immediate reaction toward stopping that dangerous stimulus, and is therefore distinctly unpleasant. But a disturbing tone or color may to a certain degree interfere with our bodily welfare too, may irritate or disturb the eye or ear, and yet their bodily effect is small as long as the light is not blinding or the sound deafening.

The color and the sound, on the other hand, may become tremendously important if they are parts of a social scene which we witness or of a spoken sentence. What we see and hear may then hurt us more than any smell or taste could hurt us. But it does not hurt the bodily personality; it strikes on the mental personality, on the intellectual or the moral self, which reacts to stop not

that particular color or tone but the whole scene of which they are a part.

Feelings Affecting Physical Well-being

The strongest reactions and accordingly the most intense feelings are attached to those influences on the body which directly destroy the bodily substance. They are the sources of pain. Every pain sensation indicates a real harm to the organic substance, and the resulting intense dislike is the great warning signal with which nature provides the human mind. Pain is, accordingly, the most useful element of human consciousness. If the suffering of pain were taken away, man's body would be endlessly more threatened than at present, inasmuch as the body itself takes care by its mental physical reactions to suppress at once the source of the destructive influence.

The organic sensations which lack of food, lack of liquid, lack of fresh air, lack of normal temperature, awake in the mind are in a similar way coupled with strong efforts to overcome the disturbance. Hunger, thirst, and so on are linked with strong feelings. The strongest contrast to pain is the lust sensation which is connected with the activity of the sexual glands. It is not the body itself which is here furthered through the organic process, but the race which is continued by the sexual function. There the individual personality serves as instrument of the race and feels the strongest pleasure in the act which is devoted to the creation of progeny. But the satisfaction of the desire for food and liquid or the healthful, comfortable warmth produces positive sensations which are pleasant because the stimulus directly furthers the interests of the body. The same may be said about the pleasure in the moderate activities of walking, running, swimming, and so on.

The feeling-differences of the light and sound sensations as isolated impressions are relatively small. Exact experiments can easily show, nevertheless, that such differences exist. The saturated colors, for instance, are more pleasing than the whitish or dull ones, the unsaturated ones. The tones with low overtones are more pleasing than those with very high overtones. True richness of feelings connected with sight and sound begins when we turn to the combinations. Two colors each of which is pleasing may give a combination which is utterly unpleasing; two tones each of which gives a sonorous agreeable sound may be utterly disagreeable when they are played together. In the field of color we find that the most pleasing effects produced are combinations of complementary colors, yellow with blue, red with green, orange with violet, and so on. In the field of sound we have agreeable effects when the tones stand in musical relations, that is, if the relationship of their number of vibrations can be expressed in small figures, as one to two, or two to three, or three to four, or three to five, or four to five, or five to six, which correspond to the chief musical intervals.

If the combinations are in space and time, we come to forms or rhythms which command not less distinct feeling reactions. A regular repetition of accented sounds, such as the rhythm offered in music or in poetry, a symmetrical arrangement of lights, a well-balanced grouping of forms essential in painting or arts and crafts or architecture, awake strong pleasure, while any neglect of such an orderly arrangement displeases us.

Here we can no longer speak of direct furtherance or disturbance of the body. It is a more complex personality which feels in harmony with the regular grouping of the impressions and in disharmony with the disorderly

grouping. Yet it is not without intimate relation to our bodily existence. We like a symmetrical arrangement to the right and left which balances simply because it harmonizes with our bodily structure. That which is equally developed on the right and on the left side awakes in us impulses and imitative reactions which correspond to the needs of our own balance. If one side of a picture were strongly developed and the other not it would force on us the feeling of tumbling over to one side. We should feel it as in disharmony with the conditions of our own equilibrium.

We never demand that the upper half of a picture correspond to the lower because in our bodily self the functions of our upper half are entirely different from those of the lower. We demand stability for the lower and freedom of movement for the upper half. Symmetry between the upper and lower parts would be directly disharmonious with the conditions of our own life. But we do demand indeed that the right and the left balance. This, of course, does not mean that in a picture the right and the left half must be strictly symmetrical. We need only an equality of impulses. In a poster a large figure on the one side may very well be balanced by a wide vista or a heavily printed description of the article on the other side. Each would give equally strong impulses to activity, would bring both sides of our personality equally into action and would therefore be felt as pleasing, while the figure and inscription both on the same side would contradict the needs of our organic personality.

The rhythmical grouping, too, corresponds to our immediate organic needs. Every accent demands a certain tension in our responses, which is followed by relaxation. If the accents follow one another irregularly, the bodily impulses become irritating and interfere with one an-

other. Our whole organism enters into a state of unrest which disturbs our normal breathing and all the other regular functions. We cannot adjust ourselves and feel it as most unpleasant. From these simple starting points we can go to richer and richer aesthetic experiences in space and time, in color and sound and touch, and we find everywhere conditions of the organic personality essential for our aesthetic appreciation.

Complexity and Variety of Feelings

But the more we come to complex conditions, the more associations, ideas, memories, and thoughts enter into the pleasant or unpleasant experiences. They no longer refer to the bodily personality. It is the intellectual and volitional self which comes into the foreground with them. But the principles remain the same. The amount of pleasure depends upon the degree with which the ideas harmonize and agree with the various parts of the personality. To see an old friend again, or to get a raise in salary, or to be successful in the discovery of an improvement in the shop, or to break the routine office work by an outing to the country, is a pleasure, but it has nothing to do with the bodily self. Each such experience harmonizes with the whole mental personality. In a corresponding way the news of the illness of a friend, or the loss of money, or a failure in an application for a position, or a disappointment in a speculation, is a source of displeasure.

Each of these experiences interferes with the personality; and yet again not the bodily but only the mental and social personality is involved. The fundamental contrast between the pleasure and the displeasure is the same as in the bodily realm. The difference between the pleasure in a financial gain and the displeasure in a loss

is the same as the difference between the pleasure in a good taste and the displeasure in a bad taste. The agreeable is always that experience which the self accepts as harmonious and the continuation of which it welcomes, while the disagreeable is that intrusion which the self rejects. Yet while this fundamental difference of the contrast between welcoming and rejecting is the same for the whole world of feelings, each particular set gives its special traits to the feeling. We have therefore a perfect right to say, as is often said, that there exist only two feelings, pleasure and displeasure, and yet we may with the same justice claim that there are numberless feelings. The pleasure in a color is not the same as the pleasure in a tone, and neither are the same as the pleasure in a friendly word or the pleasure in a successful sale or the pleasure in a great invention.

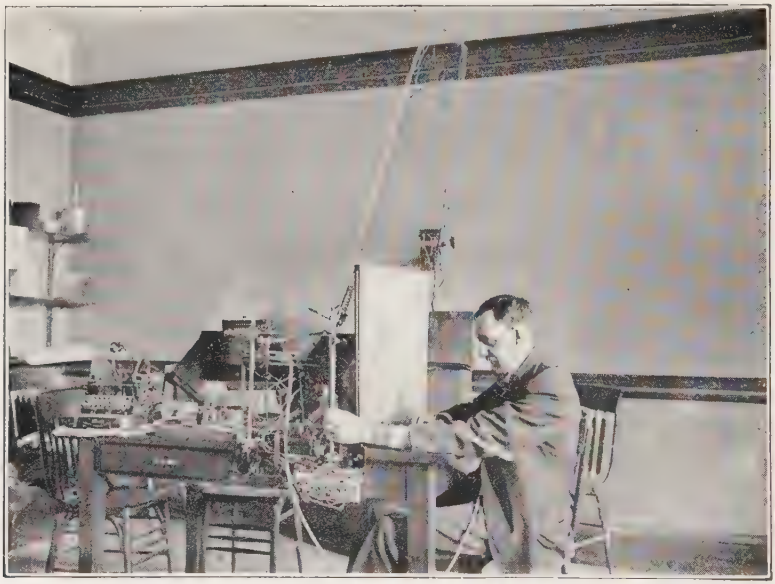
If we consider that every pleasure or displeasure involves the release of those actions by which the continuing or the stopping of the experience is attempted, we can well understand that the great variety of necessary actions for this purpose must give numberless shades to our feelings. If something approaches me and I foresee an interference, the unpleasantness of the contact may lead me to avoid the disagreeable result, but I may do this by attacking the object with the aim of destroying it or I may do it by running away in the hope of escaping it. The displeasure which breaks out into movements of attack and the displeasure which leads to flight may be characterized by the same impulse to avoid the object; and yet the total difference of the actions which are to serve the effect must give entirely different experiences to the mind.

In a very similar way I may proceed to secure the continuation of the pleasant contact either by actively

approaching the welcome source or by passively giving myself over to its influence. Even in the simplest cases where the relation to the self is one to the bodily personality the reaction may be sufficiently different to bring great variety into the feelings themselves. The displeasure in a slight toothache and in a slight headache may have much similarity, but the displeasure in the headache is very different from that in a foul smell, however disagreeable both may be, because the impulse toward the two sources of discomfort must be so unlike.

As soon as we come to the more complex influences where not a helpful or dangerous, comfortable or disturbing, physical thing is present, but where the source of the feeling is a scene or a word, a situation or a piece of news, the reactions must become still richer in variety. The reactions to an insulting word and to the news of the ticker that our stocks are going down are entirely different, however equally unpleasant the impressions may be. The affront wounds our social personality with its ideas of justice and of respect which we expect from our neighbors. The other interferes with that entirely different social personality which is composed of our plans to secure our wishes by financial means or to safeguard our future.

But as soon as we undertake to consider these complex cases we must at once be aware that many other conditions for a rich variety are given. Some experiences demand a quick reaction, others a slow reaction; some are instantaneous, others refer to more or less lasting circumstances; some contain all essential elements in themselves, and others awake large masses of memories and expectations. Some turn the mind toward the past, others to the present, and again others to the future; some refer to lifeless nature, and others to our social



The kymograph is an instrument used to represent graphically certain facts and conditions which have a bearing upon mental life. The kymograph in the center of the table has for its chief part a revolving cylinder covered with smoked paper. The various levers which are in contact with it make a graphic record of their up and down movements. The cylinder shows a number of such white lines written by the levers.

These levers are moved by the pressure of air in little air boxes which are in connection with rubber tubes. As soon as air is pressed into the rubber tubes, the levers move.

The experiment shows one such rubber tube connected with the chest of the experimenter. A pneumograph is adjusted to his chest by which every act of respiration changes the air pressure. At the same time a sphygomograph is attached to his left wrist. The beating of the pulse produces in it similar air movements. Both pulse and breathing are studied in this experiment in their dependence upon mental acts.

companions, and again others to ourselves and our deeds. We can have the feeling of enjoyment in contact with nature, but the feeling of gratitude only in contact with human beings. We can have regret only with regard to the past, and hope and fear only with regard to the future. We may even have complex feelings in which we include the feelings of others. Our envy is our displeasure in the pleasure of others; our malice is our pleasure in the displeasure of our neighbors.

Organic Response to Feelings

The experience of pleasure and displeasure from the harmony or disharmony with our self varies, however, not only in the manifold contents of the situation and the immediate action by which we prepare the going on or ending of the event. Another very important source of variations exists in the accompanying responses of our organism. The broker's feeling of joy in discovering the sudden rise of his stocks is not characterized only by the welcoming attitude of his self, but at the same time his heart begins to beat more strongly and quickly, his breathing changes, his face becomes flushed, his movements become more rapid and more elastic. If instead the stocks had gone down, he would have become pale, his movements would have become weak, his whole body would have lost energy, perhaps even tears would have entered his eyes. Almost every feeling, especially a strong one, has characteristic accompaniments in the bodily sphere, and these accompanying processes necessarily become the sources of sensations which form a background for the feeling in consciousness.

The flushing face in which the blood vessels are dilated and the pale face in which the blood vessels are contracted give a different kind of feeling. The strong

tension of the muscles or that disheartened relaxation of the muscles gives an entirely different sensation which shades the whole feeling of personality. Laughing and crying and trembling, doubling the fist and gritting the teeth, and many similar physiological processes enter into the experience. The inner organs too are affected. Distress and worry ruin the appetite; the stomach does not produce its normal secretions; even the saliva glands do not work. Other feelings produce an abnormal activity of the kidneys or of the liver. In short, the whole organism reverberates when strong furtherances or interferences with the personality become effective. They have their indirect influences on the whole rhythm of mental behavior. In a state of grief and depression the associations are inhibited; no new ideas enter the mind. In a state of exaltation and inspiration and great enjoyment the ideas rush freely to consciousness.

Nature of Emotions

Only when the feelings are accompanied by such bodily changes and their effects on the mind are we accustomed to speak of emotions. Thus in the center of every emotion we have a satisfaction or a dissatisfaction, but this core of feeling is surrounded by an abundance of other elements which give character to the subjective state.

Some acts and bodily expressions may be the inheritance of old racial experiences, some are probably only an overflow of excitement or the result of a stopping of normal excitement. But there is one aspect of these emotions which is extremely important. The value of the emotion as against the simple feeling lies in the fact that through this participation of the whole body the personality is concentrated on the one line of action. The interests and the attention of the self become focused on

the one center of emotion. Everything else which was going on in our mind is swept away. The thousand little thoughts and cares which were with us are forgotten; the one great source of enthusiasm or of anger holds our whole mind and presses all our resources into the service of the one great act toward the goal which awakes our enthusiastic response, or into the fight against the opponent who made us angry. *The emotion is thus the useful means of re-enforcing the feeling-appeal.* The source of the feeling is no longer a mere chance experience which allows many other experiences besides, but it takes hold of our total personality and releases thereby energies which would not be awakened by an ordinary feeling. The emotion is the great appeal which mobilizes all our energies.

Aesthetic Feelings

We may give attention still to only one group of feelings, the aesthetic feelings with which the beautiful object impresses us. We ought rather to say that we call beautiful the object which awakes in us aesthetic feeling. What are its characteristics? Surely it is a feeling of pleasure. Yet the beautiful is more than the merely agreeable. In an essential way it is even its opposite, because the agreeable is that which we want to make use of; we want to eat the agreeable food. The truly beautiful, in the higher sense of the word, inhibits in us the impulse to possess the object. We want to enjoy the sight of it, but we do not want the object itself. We do not embrace the beautiful statue of Venus; we have no appetite for the painted fruit. True art must so show us everything that we are unwilling to act toward it. It is a pleasure in which the impulse to action is completely suppressed. We do not want to sit down with the people

on the stage; that drama is closed in itself and we do not want to mix in. We enjoy the comedy, but we do not participate in the joy of the persons in the play. Nor do we hate the villain in the melodrama. The beautiful object is thus detached from our personal desires, while every merely pleasant object is the goal of our personal wishes.

This must, of course, not be confused with our desire to possess, for instance, a beautiful painting or statue. The artistic work which we possess is a piece of canvas with oil color or a piece of marble. They have, as such, only economic value, and the pleasure which we gain from their possession is not the pleasure which we gain from their beauty. We desire the picture because we want to have it on our wall in order to enjoy its beauty whenever we wish. But this enjoying of the beauty is a pleasure which excludes any desire for the subject of the picture.

The aesthetic emotion which detaches us from the source of our happiness and brings our practical actions to rest, accordingly, plays a role of its own, different from all the other feelings of happiness and joy which are based on personal interests. We said that every pleasure results from the harmony of the object with the personality. This pleasure is not selfish; a higher spiritual personality is involved which is common to everyone who grasps the ideals of beauty. Every other kind of pleasantness is dependent upon the chance conditions of the personality; one likes cigars and another does not; one enjoys sweets and another hates them. But beauty is enjoyable for everyone who possesses an aesthetic personality at all. Yet the beautiful is not the only experience which satisfies the ideal personality. We must couple with it the true and the moral. Truth and morality bring satisfaction too. Yet again it is not an indi-

vidual personality which profits from them and enjoys them. There is no personal, selfish interest felt when we enjoy a noble, moral deed. Our spiritual personality is satisfied.

Everything which brings pleasure and is thus in harmony with the personality is for that personality a value. Those sources of pleasure which appeal to the spiritual personality, the beautiful, the true, the moral, are the ideal values, or, as we may also call them, the eternal values, since they are independent of the chance conditions in time. The knowledge which is really true must be true forever and for everybody. All the other values refer to the particular personalities. The satisfaction which they bring is limited. The values which are dependent upon the special personalities which receive them are the goods. The business man has to do with these goods only. He furnishes the world and distributes in the world the objects which are in harmony with the needs of the personalities.

The physical personality, the mental personality, the social personality, each welcomes the objects which are in harmony with its conditions and which are therefore pleasant, agreeable, and delightful. Everything which is contrary to the conditions of the personality is rejected, therefore appears disagreeable and unpleasant, is therefore not a good, and is not fit to enter into the economic circulation. The feeling interests of the personalities remain the ultimate cause for the whole economic interplay. Whatever industry and commerce create and set in motion must awake pleasant feelings in someone. The goods have to pass through many stages and change hands many times before they reach the personality in which that ultimate satisfaction and pleasure are secured. This is possible by the introduction of money, which in

itself has no value and is unfit to give pleasure by its own substance, but which by social agreement can be substituted for any possible economic good and becomes the standard for the pleasure value of all of them.

The Feeling of Value

The feeling of value of the goods to be purchased must for this reason also become the decisive element in the advertisements. We have spoken of those factors in the advertisements which simply draw the attention and try to hold it and impress the announcement on memory. But it is still more essential that it awake the feeling of pleasantness, of agreement, of sympathy, making the possible purchaser wish that the advertised object may agree with his personality. Certainly the personalities differ. Men and women, young and old, rich and poor, city people and country people, men with interest in sport, or in books, or in music, or in travel, or in politics, represent very different dispositions for pleasure and sympathy. Moreover we have seen that every individual can come in question sometimes as a bodily, sometimes as a mental, sometimes as a social personality. Thus the advertisement must be carefully adjusted; but some kind of personality in the reader must feel that the offered goods are in agreement and harmony with its setting, or the advertisement will be in vain.

The first step to this triumph over the feelings of the reader will be taken by the merely formal means which secure a general feeling of pleasantness. The well-proportioned arrangement of the advertisement, the charming colors used in the poster, the appeal to humor, the gracefulness of the drawing, the politeness of the language, the originality of the make-up, all will have not only the effect of drawing and holding the attention but

much more of bringing the spectator into that comfortable mood in which any news is received with a certain willingness. Where the opposite is the case, where colors are harsh, the arrangement clumsy, where it is difficult to read the text, or where the words are trivial or stale, the personality has a general feeling of discomfort and receives any content as a kind of interference with the personal attitude. Even the most attractive offer would have an uphill fight to make under such circumstances.

Yet this appeal to the general feeling of pleasantness is not sufficient to sell the goods. It only prepares the way for the feeling effect which the content of the announcement tries to awake. The personality feels attracted because the object suggests an appetizing flavor, or gives a feeling of safety, or promises elegance and fashionable distinction, or great economy, or improvement of health, or personal beauty. Often the social personality feels itself furthered by the thought of buying that which is used by well-known persons or which has the approval of public opinion. Where it is fitting, the appeal to the parents' love for their children, or to patriotism, or to religious faith, or to confidence in scientific results will be sure to supply economic value to the advertised goods. Psychological experiments in which advertisements with different feeling appeals were graded by twenty men and twenty women showed as average that the idea of health appeals to the personality most strongly, next comes that of cleanliness, then of scientific justification, then of timesaving, of appetite, of the desire for efficiency, of safety, of durability, of high quality, of modernity, and so on. Where no element of the personality welcomes or rejects an offered good, no feeling is stirred up, a state of indifference exists, and nothing can induce the reader to purchase the object, as

the purchase means the sacrifice of money, and this money involves the giving up of some opportunity to secure the sources of pleasant feelings.

The Value of Pleasure in Work

We have spoken so far only of the feeling of value which the final product produces and which indeed gives ultimate meaning to all industrial and commercial transactions. Nobody would manufacture any goods and nobody would distribute them in the world if they had not finally value of satisfaction for some personality. The moral man performs the good and noble deed for its own sake. If no man sees it, God sees it. It is done because it is good. But in the economic world nothing is done for its own sake. If taste changes and no one any longer has pleasure in a certain thing, no factory will turn it out and no department store will handle it. But while the pleasure in the commercial goods must be the normal condition for the whole process, we must not overlook that this alone is not the only point at which the industrial and commercial life come in contact with the psychology of feeling.

Nobody would manufacture and sell silk stockings or graphophones, or would raise oranges, or would fish for lobsters, if there were not people in the world to whom the wearing of the stockings, and the listening to the graphophones, and the tasting of lobsters gives some pleasure. Their enjoyment is the spring of the whole transaction. But to perfect the stockings, to weave them and to dye them, to distribute them to the retailer and to sell them to the girl who wears them, involves the activity of hundreds who have to co-operate in a most complex way and of whom not one shares the enjoyment of wearing that pair of stockings. The grower who picks the

oranges in his California orchard picks them in order that the New Yorker may enjoy them at his breakfast table. He himself does not consume his fruit which he sells and those hundreds who are engaged in its transportation and who carry the oranges from the Pacific to the Atlantic or who sell them in the grocery store cannot feel the pleasure in the taste of the juicy fruit.

Yet no one of them would have an interest in his activity and therefore would not be willing to raise a hand in that complex transaction if there were not something which satisfied him and which gave him a pleasure feeling in exchange for his contribution. The workingmen who weave and dye the stockings and the salesmen who spread them out on the counter must link these activities with some pleasure, just as much as the final purchaser of the goods couples pleasure with their use. The mere physical activity of tending the machines in the textile mill or the running about as traveling salesman to the shops cannot be in itself the incentive. In so far as it is fatiguing and connected with hardships it even awakes unpleasant feelings which, as we saw, tend to stop the source of the discomfort. Workingman and salesman would therefore give up the work if their disagreeable sensations were not outbalanced by stronger sources of pleasantness. These are, of course, given in the wages for their work and in all the secondary agreeable features of their industrial or commercial position. Hence the essential effort must be to adjust all business life so that the pleasant feelings are stronger than the unpleasant feelings in everyone who contributes to the great process by which the pleasant object is finally brought to the purchaser.

The subtlest balancing and the most careful grading of the pleasures are always needed. High wages may be less pleasant than lower ones if the higher ones are uncertain

and the low ones certain and steady. Nor will the high wages alone be decisive if they go together with working conditions which interfere with the enjoyment of good health or with the pleasure in sympathetic human relations or if they are coupled with excessive fatigue from the work itself. In every case the relation to the needs of the personality will be the controlling factor.

The pleasures which the captain of industry or the great merchant or the banker derives from his work will have very different sources from those which feed the emotional life of the workingman, but the situation as a whole is the same. Their mental personality is composed from other factors and the processes which agree or disagree with their personality are therefore different. But the harmony or disharmony with the energies of the personality remains here too essential. Such a leader of business life enjoys not only his financial income but his power over the market, his social standing, the luxury at his command, his influence on public affairs. All these social effects are necessary for him to maintain that feeling of vitality which forms the core of the self. Wherever these feelings respond the desire to work toward the continuation and strengthening of their sources must result. Where the conditions are unfavorable for the inner development of the personality, where disappointment sets in and worry follows, where failure comes and loss, the emotional reverberation of distress and grief interferes with the energetic activity.

Imagination

The higher the life work the more the pleasure, and the resulting interests are independent of the momentary impressions and are linked with the whole situation, including what the future may bring. The simplest work-

ingman reaches a higher level if he does not ask only for the pleasure in the wages of the day, but also considers his future and the joy or misery to which his life may lead him. The joy in the gifts of the future can be far stronger than the satisfaction in the offerings of the present. Here lies the spring of the power of imagination. Through imagination a possible joyful achievement of the future is anticipated in the mind and the pleasure in this hoped-for effect becomes the moving force for the inner life. The inventor holds before his mind an unsolved problem, anticipating the joy which its solution will bring him in the future. This joy has stronger hold on him than any suffering or deprivation which he must undergo in the pursuit of his distant goal. His personality is widened so as to include all those possible coming experiences. He does not feel the hunger of today because he is thrilled by the glory of the future achievement.

These joys of the imagination can enter into every life, the humblest as well as the noblest. Everybody's imagination can turn to possible improvements and developments toward which his efforts are directed. No business life is really successful which is not aided by some kind of imagination. Nobody lives from the satisfactions of the present only. Anticipated joys of the future are the chief motives to action. Every successful life is, after all, a life with a life plan. Only where strong feelings are attached to the ideas of worthy ends can the whole work be organized for true achievement. The action of the attention is only a means in the service of feeling. Feeling alone is the true incentive to action. But this indicates that a true understanding of the mind at work is possible only if we consider the activities of the mind as well as its knowledge and its interests.

TEST QUESTIONS

1. What effect do feelings have upon attention?
2. What do physicians mean by the hysterical splitting of the personality?
3. What are some of the most elementary laws of feeling?
4. What is meant by symmetry in objects? Why does the absence of it produce a disagreeable effect?
5. How does the body itself respond to feelings? Describe the bodily reactions of a business man who has just received joyful news.
6. How do the aesthetic feelings benefit a business man?
7. How do the needs of the physical, mental, and social personalities differ?
8. How does the advertiser use the feeling of value in his advertisements?
9. How do you increase your pleasure feeling in your own work?
10. How does imagination enrich life?

PART FOUR — ACTIVITIES

CHAPTER X

IMPULSE AND WILL

The Complexity of the Will

Every human function which has economic significance must culminate in action. Thoughts or wishes, feelings or emotions, impressions or memories, which have no influence on an external action are entirely irrelevant for practical life. To be sure, the action need not be a movement of the arms or legs, the turning of a wheel, or the carrying of a package. The writing of a letter, the speaking of a sentence, even the turning of the head, or the directing of the eyes to a certain point may be the total outer effect. The nodding of the head may complete a big business transaction. The writing of a figure on a check may decide upon the economic results of a lifetime. Somehow every mental process which has commercial or industrial interest must end in such an action and that means in some muscle contraction.

We are accustomed in popular language to refer all such actions to our will. It is our will which makes us say "yes" or "no," which makes us take up this or that work, which writes our letters, and makes us buy or sell, undertake an enterprise or carry it out. But such a reference to the will may easily mislead. It suggests that there is one mental power in the center of our mind which decides in an autocratic way what is to happen. Such a

will-power does not exist any more than a special memory-power or perception-power. We have millions of perceptions in seeing and hearing whatever occurs; we have millions of memory-images in experiencing the reproduced mental states. And it is nothing but a word if we take all these perceptive processes together and call them the products of perception, and bring together all the remembered experiences and call them the products of memory. The real thing is not one memory, but millions of memory-reproductions.

In exactly the same way, the real thing is not will but the millions of volition processes which go on in us. Each one arises from the special mental conditions, not through the agency of one general will behind it. Our mind is not an autocratic monarchy but a republic in which each individual volition has its complete responsibility. Then the word "will" serves only as a general label for all the manifold acts of volition. Our problem is accordingly not, what will is, but what the characteristic traits of all the volitional acts are. Under what conditions do we call an act of ours a will-act?

Certainly not every movement which our muscles perform under the influence of our mind is a real will-act. On the contrary, the more earnestly we study actual happenings the more we must recognize that far the largest part of our movements is performed without any real will-experience. Moreover, if we trace the processes back to the beginning of our individual development, we discover that the will is anyhow a late development and that the child performs complex acts before the will makes its appearance. We are too readily inclined to be trapped into a wrong conclusion. We find that our will can produce an action, and we draw from that the entirely misleading idea that wherever an action is performed

by us our will must stand behind it. The right idea, which is becoming more and more familiar to the modern psychologists, is backed by a very different set of facts. We know today that *every impression, perception, or idea has in itself the tendency to be transformed into action.* Yes, we may say that this is the fundamental thought of our present-day psychology.

According to the older view, psychologists treated the sensations or perceptive ideas or memory-ideas or thoughts as if the processes were completed when our mind took hold of them. An idea, a thought, a memory, is experienced and that is the end of it. It seemed only an accidental affair if afterward there arose an impulse to act in accordance with that thought or memory or perception. The impulse to act and the resulting muscle contraction appeared as an appendix which was superfluous for the development of the idea. Those perceptions and memories might fill the mind and might excite the sensory centers of the brain without any contact with those spheres of the personality in which the doings of man are generated.

The Unity of Mental and Physical Acts

Today we should say that such a separation of idea and action is entirely artificial. They belong most intimately together; the one cannot exist without the other. An action which is not guided by ideas, if we use the word in its widest sense, would be useless and meaningless. It would be a haphazard muscle contraction without adjustment to the surrounding world, which we know through our perceptions and thoughts. But the ideas without actions would be no less superfluous for the welfare of the personality and all the facts which we know indicate that such detached ideas have no real existence in our

world experience. From the first instant of human life impressions lead directly to actions. The nervous circuit in the brain does not find an end station in those sensory centers to which the sense organs send their messages. Those sensory centers are only way stations and the excitement is carried on to the motor centers in the brain from which the impulses lead to the muscles.

The baby who swallows the sweet milk or still earlier begins life with crying in the cold air performs characteristic actions which are the necessary result of the given nervous connections. The sweet and warm taste stimulation of the tongue by the milk reaches the brain and the excitement in the brain is accompanied by the sweet and warm sensations. These awake directly, without any mixing in of will or decision, those motor brain centers which send impulses to the muscles of mouth and throat by which sucking and swallowing are performed. The child perceives this transition of the brain-action into the movements by which the warmth and sweetness will be continued as a feeling of pleasure; and finally he perceives the action itself, the sucking and swallowing movements which furnish the mind with the corresponding movement sensations. Thus the infant becomes aware of every part of the process from the first contact of the tongue with the milk to the last useful action by which this contact is continued.

If, just to reverse the situation, instead of the warm milk some bitter fluid is applied to the lips of the child, as has been done by physicians for experiment's sake, in the very first minutes of life the brain responds in a useful manner. It switches the excitement not into the centers for swallowing and sucking, but into the opposite ones for rejecting the dangerous substance, withdrawing the lips, throwing out what has entered the throat, and

closing the mouth. The accompanying mental process is a feeling of displeasure, as the mind always feels displeasure when the brain develops those actions by which the stimulus is discontinued, and finally the perception of the rejecting response itself.

The nervous brain tracts are thus from the beginning prepared for the most useful reactions. To be sure, the circle of stimuli for which the brain of the baby is prepared is very small, because very few chief paths are completely developed. But every month brings new brain passage-ways. At first the child responds only very clumsily by his eye movements to light impressions. Soon this reaction becomes accurate. The light, which excites a certain spot in the retina, is led to the brain not to end there as a light sensation, but to strike on the motor center which leads to the exactly appropriate reactions of the eye muscles. The eye turns toward that light so that the light falls on the center of the retina and gives the sharpest possible image. In a similar way the tactual sensations and visual sensations lead to grasping movements. The child stretches out his arm for the toy, but also for the moon. The action is not performed with a particular will, but in an entirely automatic way.

Automatic Actions

Let us call those actions in which the impression or idea of an outer situation leads to an action without the conscious interfering or interposing of a special will, "automatic actions." Then the question arises: To what extent do such automatic actions occur in our ordinary life? We insisted only that our life begins with them. But is the situation such that these automatic actions are forms of activity which occur only in the undeveloped mental mechanism of the child, but which are overcome

as soon as a higher stage of fuller development is reached? Is man's life cleared from such merely automatic reactions? Are they replaced in his activities by the actions of the will? Certainly not. On the contrary the automatic actions also remain in the adult and the most highly developed mind as the typical forms of human behavior.

True will-actions make up by far the smaller part of our responses to the world. The workingman who stands before the machine with which he is familiar may have to perform a dozen different actions one after another in response to certain signals from the moving parts. He sees the turning of a wheel or hears a click and he immediately reacts with a correct and useful muscle contraction. He does not exert any special will-effort to do the right thing and to choose it among many possible wrong things. The one impression automatically awakes at once the impulse to the one action which is fit.

When his work is over and he goes home, he may have to take many a step and make many a turn through the streets from the factory door to the threshold of his house; and yet he does not move his legs on the street by special will-actions. He may not even give any attention to them. He may be absorbed in his thoughts or may be talking with the friend who accompanies him. Yet his walking home is not done without consciousness. He escapes passing automobiles, he takes the right turn every time in response to what he sees and hears and to the tactual impressions which his feet receive. But even if he talks with his friend on the way home, are not most of his remarks and answers probably speech movements of simply automatic character? If his friend approaches him with the question whether he is going home, he answers "yes," and if he asks him whether he has seen the

paper, he answers "no," and if he asks what the name of the man who passed them is, he replies with the name; his answers come just as automatically as the movements of his feet in response to the optical impression of the street.

But it may be different. If he has the intention not to go home, but to the next saloon, he may have reasons not to tell his acquaintance. Then a more complex mental state arises. The automatic reply would be, "No, I am going to stop at the saloon." But before that impulse is carried out, an association arises, an idea of a social disadvantage resulting from that answer, and this associated idea will automatically lead to the suppression of the first impulse and to the opposite impulse of covering his intentions by the claim that he is going home. Then the two possible answers will be before his mind, one connected with the idea of social discomfort, the other with the idea of truthfulness. A rivalry between the two begins; secondary ideas cluster around them. Finally one of the two possible answers will be given, but whichever it is, it is given with a conscious will, with an inner decision, with a feeling of responsibility, with a state of mind in which the action is no longer automatic.

Will-Actions

We can generalize this. We have a will-action before us only when the end to be reached is somehow in our consciousness before the action itself proceeds. The idea of the end to be reached may be vague and loose and indistinct in our consciousness, but somehow it must have entered our conscious mind before we perform the decisive steps of the action itself if we are to value the action as a product of our own will, as against the merely automatic performance. But now we see from this

most trivial illustration why we have a right to put so much emphasis on the difference between a will-action and an action without a specific will element. We see that only the cases in which the idea of an end is in us before the act is gone through offer us a chance to stop the action and to do something else.

Of course the automatic action too is the product of our personality, as it is dependent upon the connections which are formed in our personal brain-system. But as long as our brain acts without bringing up the idea of the end before the action, we have no chance to bring forward all those associations and ideas which may warn us against the performance and its consequences. Only where the idea is in us beforehand and all our memories, and knowledge, and thoughts can enter into play, can we really say that we ourselves are responsible for the choice of our action. We foresaw and accepted the consequences and we did not interfere with the process. We did it in freedom; we could have done otherwise, that is, we could have put the whole weight of our attention on those opposite ideas which would have stopped the action and which would have freed us from its consequences. The conscious thinking of the end before the movement is carried out indeed makes the greatest difference in the world in our actions.

Abnormal Actions

We throw light most directly on the situation if we compare our normal action with abnormal situations. The mind which is in an abnormal condition experiences will-impulses like any normal mind. Even the idea of the end may come normally into consciousness but somehow the mental mechanism is disturbed and the associations are absent or are not effective; in short, something inter-

feres with the regular procedure. Therefore we have no right to consider the action as free and to make the actor himself responsible for his deeds. The patient who suffers from fever delirium is not responsible if he throws himself out of the window. His mind does not bring to him the normal idea of the danger. He is unable to inhibit the impulse and his feeling leads directly to the dangerous act. It is not an act of suicide which he commits, because it is not really his whole self which is acting. He is not responsible.

The paranoiac who shoots at anyone against whom he believes himself to have a grievance belongs in an asylum, not in a prison, because his brain mechanism is destroyed. There is no normal interplay between the various ideas which lead to action and the opposite ideas which check the action. The thought of killing the supposed enemy is automatically transformed into this act of violence. Even the drunken man is not responsible for his action. Perhaps he answers a word which he dislikes with a vehement insult or with a blow. In a normal state the idea of such an end to be reached would have forced itself on his consciousness with all its dangerous social consequences. This idea of the danger and unfitness would have been sufficient to paralyze the motor impulse. But as soon as the actor is under the influence of alcohol, those mechanisms in the brain which could inhibit the actions are temporarily paralyzed. The inhibitory power is checked and the result is that the action of speaking the insult or of striking the blow is rashly carried out.

Development of Will-Actions

We can easily understand how in the child's life this more complex process begins to develop. The child performs his actions of grasping or sitting or turning or

walking or playing or making a noise in a purely automatic way. But whatever he performs, he becomes aware of the effect. The block on the table awakes his impulse to grasp it. But as soon as he grasps it, he perceives his own grasping. The order of events for him is therefore first to perceive the wooden block on the table and then to perceive the muscle sensations of grasping and finally to perceive the block in his hand. The outcome is that associations are formed. The experienced order of brain events becomes linked in the nerve mechanisms. The next stage must be that if such a wooden block is seen again on the table, it not only awakes the impulse to grasp it as before, but that through the still quicker associative connection the memory-image of those movement sensations and of the idea of the block in the hand arises in consciousness.

If we take the case that it was not a wooden block but a knife, with which he cut his finger, the process will be still more complex. The seeing of the knife in the future will awake again the impulse to seize it, but the associated memory-image of the movement sensation and of the picture of the knife in his hand will now be linked with the memory of the pain from the cut. This idea of the resulting pain will be strong enough to produce the opposite effect; the action will be stopped. The idea before the action is thus entirely the product of mechanical associations; and yet the presence of these associations secures the will-character for the deed. All the earlier experiences of the child become in this way serviceable in selecting his action. It is a true will-action.

This development is going on all the time. We adult persons come to new will-actions also by first passing through automatic actions, learning their results, and bringing up the memory-images of them in the service of

more complex actions to be performed. To be sure, in the center of such actions we find in our consciousness a special feeling of decision. There comes a moment when we are aware that many actions are possible but we want to perform just the one. We select it out of the rival ideas of ends. Is there not, after all, some special will involved which gives a push to one action and suppresses the others? Yet this feeling of impulse is only the idea of the first step to be taken. Most of our actions involve a whole chain of movements.

If we are to undertake a journey, as many of us often must, we do not have one motor impulse before us, but a system of thousands of actions. The muscle contractions which we need for buying the railroad ticket or packing our trunk are not the carrying out of the journey. The idea which we have in mind before we begin that chain of actions may not be the act of traveling, but perhaps the sight of the city which we want to visit or the names of the men on whom we want to call or of the hotels which we are to frequent. If we are undecided whether we ought to undertake the journey or not, the idea of that distant town and of our calls there may rival in our mind the idea of the comforts at home or the tasks which we might carry on at home or the idea of saving the money which the journey will cost. There comes a moment when the final decision must be made whether we will travel or stay at home.

But if we analyze it carefully we find that even this act of decision is again nothing but such a thinking of the end with the emphasis which leads to action. Only this end is now not the final end; it is the first step, the first movements to be carried out. If these first movements are present in the mind in the form of movement-sensations, they are felt as the immediate introduction to the

whole performance and are taken as the necessary signal. They rise, therefore, to the dignity of a decisive factor and give us the feeling of an ultimate impulse to go on our journey. Their immediate effect is a new setting of all our brain connections by which every idea is carried into the appropriate paths in the service of our plan for the journey. All the further processes are then almost automatic reactions. The chief point for us is that here too the so-called will element, the act of decision, is nothing but this idea of the end in the mind before the act is performed.

Interplay of Automatic Actions and Will-Actions

The building up of our will-actions, however, demands a further consideration. Our automatic actions, we saw, become will-actions as soon as by association the memory-idea of the perceived end enters consciousness before the action is performed. Our will-action, on the other hand, can at any time become automatic; and this is very important. It is the very condition of our development in the world of our practical affairs. Of course, it would not help us if it were simply a turning of this will-action into the original automatic action. The true situation is this: Our automatic actions become will-actions, and thus become subordinated to our plans. We can use them in the service of our ends, and we can combine them for new ends which could not be reached automatically. The single hand and finger movements of the child are proceeding automatically until they are under the control of the will by the acquisition of those movement sensations.

When that stage is reached, many of these movements can be combined, for instance, into the writing movements, which could never arise automatically. They are the result of those conscious will-efforts. But as soon as

these complex actions of writing have been performed repeatedly, this whole complex will performance can become automatic. The mere idea of the word to be written leads to the total set of movements without any particular idea of the movements to be performed, and that means, without any special will-effort, to write the word. When the adult person writes a letter, the idea to be expressed secures the nervous action by which the fingers move in the correct order until the whole word has been written down. The writing itself has become as automatic as originally the simplest finger movement. This alone makes it possible to use the finger action of writing in the service of still more complex will-activities, like bookkeeping or correspondence. The trained typist responds to the sound of a spoken word by the finger movements on the keyboard of the typewriting machine without giving any will-effort to the choice of the particular keys. His will-actions, which were at first difficult, have become automatized.

In this way we have an endless interplay. Automatic movements with which nature has provided the nervous mechanism are made parts of complex will-actions, and by repetition these will-actions themselves become automatic. As soon as they are automatic, they can again enter as parts into more complex will-actions. But most of our life is carried on through the agency of these automatic performances.

Application of Principles in Business

So much of the theory of impulse and will is surely needed to understand psychologically the details of industrial and commercial activities. More than that, whoever understands clearly these theoretical principles can easily deduce from them the answers to any special questions

which a concrete situation may offer. Every function in the business sphere culminates in some action, and every effort to improve the work must be controlled by understanding of these actions and their causes. As long as the actions are considered only from without, every endeavor for improvement must remain superficial, like the treatment of a patient by a quack who deals only with symptoms and does not enter into the origin of the disease. But if the psychological conditions of activity are clearly understood in general, then it is easy to find for every special case the most favorable conditions and the means to improve the situation. The interest will center on the one side in the problems of learning and training, on the other side in the problems of the most favorable conditions for commercial and industrial activity. In both spheres the practical discussion is essentially nothing but an application of the principles which we have discussed.

However, before we turn to these two groups of specific questions, we may consider one more consequence of the theory of the will, namely, that change of activity by which the action is performed under the influence of a suggestion. It has distinct practical importance and we may therefore treat the theory of suggestion here as an appendix to the theory of the will.

TEST QUESTIONS

1. How would you define the will?
2. How does the modern view of the relationship of mental states to bodily actions differ from the older belief?
3. Distinguish between automatic actions and will-actions. Which are used most?
4. When do we really have a will-action?

5. What is the tendency of an oft-repeated will-action? What practical bearing has this upon industrial activities?

6. What are abnormal actions? How are they produced?

7. How is will-power developed?

8. How may will-actions become automatic? What are the economies of such actions?

CHAPTER XI

SUGGESTION

Internal and External Sources of Ideas

We saw that an action is first of all the direct automatic outcome of ideas and that particular importance is attached to those ideas in which we are imagining the ends of possible actions. Such an idea of an end may be brought to our mind by a proposition from without. We motor along our road and see there a guide-post saying that the right-hand road leads to our destination. The idea of the movement of turning to the right enters our mind and we change the direction of the car.

The mental mechanism involved is rather complex, but it can easily be traced. The guide-post awakes in us confidence that it is authorized and helpful advice which is offered, and therefore we feel that it is in accordance with the interests of our personality to stick to the proposed idea. The image of turning to the right is welcomed accordingly as harmonious with the needs of the self. It becomes accentuated and focused in our mind and through the well-trained associational connections the idea of turning sets the motor centers of the appropriate muscles into action. We leave the forward road and steer to the right.

But let us take the case that a friend is in our car who tells us that he positively knows that the road to the right is being repaired and cannot be used by motor cars and that the only possible way is straight ahead. A con-

flict of the ideas of possible actions is now going on in our mind. If we are convinced that our friend has the interest of our personality in mind and that his powers of observation and of memory are alive and that he is not confusing earlier experiences, we shall feel that his proposed idea is more completely in agreement with the interests of our self, and we shall drive straight ahead. This is the typical case of a normal rivalry of proposed ideas, a rivalry in which the one idea will become efficient which appears most in agreement with the setting of our personality and its aims. For that purpose many associations may have to be called to help in our dilemma. During our drive we might not be satisfied with the advice of the guide-post or with the advice of our friend, but we might back the one or the other idea or both by secondary associations. We might remember that someone else told us of those repairs. On the other hand we might think that if the repairs were going on, some announcement would be made there at the crossroad. We might also remember that our friend is sometimes inclined to erroneous reports through confusions of his memory. In short, there may be a battle of the rival associations, but both sides have perfectly fair chances.

The situation would not be different if only one of the two propositions came from without and the other from within. If I have gone along that road repeatedly and have found out that the way to the right was the correct one, then I do not need the guide-post. My consciousness furnishes the idea of the end; I turn to the right, guided by my own intention. If now my friend interferes with his proposition, I can soberly balance my idea and his, and can compare my arguments and his.

Weakening Internal Resistance

But let us carry this case a little farther. Fancy that I am extremely tired. After a poor night and a long drive I am exhausted and give little attention to the ideas which cross my mind. When I approach the crossroad, I should naturally turn to the right, but my friend insistently says, "You must go the straight road." His words bring that idea of going ahead strongly to my mind while, because of my state of overfatigue, my own associations are weakened; they do not come readily to my consciousness and the result is that I do not offer the opposition which naturally would have come up. I accept the idea of action which my friend threw out, and automatically the proposed idea leads to my activity; the normal resistance which I ought to furnish from my own resources fails to come forward, as I am too careless on account of my fatigue.

Fatigue, however, is not the only condition under which such a result may occur. I may be a very credulous person and may have an unusual amount of confidence in the superior wisdom of my friend. This would express itself in a frame of mind in which I would suppress from the start all the ideas of actions which were contrary to those which he proposes. The idea of action which he brings before my mind would then work almost like a command which I do not resist but which I carry out mechanically.

We may think of still another case. If I were that kind of person, I might have taken a few drinks. By the influence of the alcohol the resistance power of my brain mechanism would have been decreased. Even without particular confidence in my friend, I should have accepted his proposition, simply because the alcoholized brain cells would have been unable to bring up the opposing ideas.

The result would have been that the words of my friend would have worked as if they advised the only possible action, and mechanically I should have accepted his proposition.

In such an exhausted or overcredulous or drunken personality we no longer have the full process of normal will-action with the normal interplay of motives. Anything which is proposed forces itself on the mind and excludes the ideas of opposite action which otherwise the situation would bring to consciousness. To be sure, this has its limits. If the driver, however exhausted or credulous, is told by his friend to go straight ahead when it is evident that the straight way would lead into a river, the brain would find its resistance. The sight of the imminent danger would throw the resisting idea sharply into consciousness and would be strong enough to overcome the perilous advice after all. If the alcohol poisoning was very strong, even such a dangerous situation might not have power enough to excite sufficient resistance to the impulse for the proposed action. The drunken man sees that river, but it does not awake the normal associations. It appears to him in that moment like a joke to plunge the car into the water. The lack of resistance by opposing ideas may accordingly pass through many degrees. The resistance may have suffered very little from a slight degree of fatigue or may have suffered tremendously from a narcotization of the brain.

Nature of Suggestibility

A proposition to action which is brought to the mind in such a way that the idea of the opposite action is more or less suppressed is called by the psychologist a "suggestion." The state of mind in which an individual is especially ready to accept such suggestions is called

"suggestibility." This suggestibility can pass through many degrees of strength. Human beings differ with regard to their suggestibility anyhow. We all know persons who are very much inclined to do whatever the latest adviser tells them, while others represent the opposite extreme, are stubborn and always unwilling to accept any advice. The psychologist even recognizes negatively suggestible persons who feel an impulse always to do the opposite of what is proposed to them. But after all they are exceptional. The normal situation is for a proposition to awake an impulse but at the same time it awakes the idea of possible arguments in opposition, if the situation demands them, and only the very suggestible persons are without these opposing ideas.

Yet every one of us, even without alcohol or narcotics and without overfatigue, may pass through different stages of suggestibility at various times. It is well known, for instance, that we all are more suggestible in a strongly emotional state. Hope and fear make us very suggestible. Anything which impresses us, like a church service or a court trial, makes us more than normally willing to accept the propositions which come from without and to offer no resistance by opposed ideas from within. The lawyer makes many a witness affirm a statement to which he might have objected in ordinary conversation. But the solemnity of the action has brought his mind into an oversuggestible state in which the opposing ideas are inhibited and the ideas which the lawyer proposes are accepted without resistance.

Hypnotism

The suggestibility can certainly be strongly influenced from without. We can make a person more suggestible and thus bring him into a mental state in which he is

more willing to accept our propositions on account of the decreased resistance by opposing ideas. The strongest possible intrusion of this kind is hypnotization. There is nothing mystical in hypnotization, and it is not difficult to hypnotize a person, however harmful it may be to do so. The only legitimate aim of hypnotization is medical treatment. If, for instance, a patient has an irresistible tendency to use morphine or cocaine, the mere saying to him that he ought not to use it remains fruitless. His craving for the injection is stronger than any proposition of the physician. But if the physician hypnotizes him skillfully, he may increase the suggestibility of the patient so strongly that the mere suggestion that he will not take morphine injections again may indeed be stronger than the acquired desire and may bring back the victim to normal, healthy life.

This increase of suggestibility is indeed the most essential feature of the whole hypnotic state. It is produced by applying faint stimulations to the senses of the person to be hypotized and is much aided by appropriate words. The physician tells his subject that he will fall asleep, that he feels tiredness creeping over him, that a general relaxation will set in, and so on, and slowly the hypnotic state takes hold of the mind, a state which stands halfway between waking and sleeping. No special energy flows from physician to patient. The sense-impressions and words alone perform the work. In any case, as soon as the hypnotization is accomplished—and with skillful operation it can be accomplished with anyone—the power of mental resistance is broken. If the hypnotizer were to tell the hypnotized person that he ought to hand him his pocketbook, the idea that that is a scandalous theft would not enter the mind of the victim at all. The idea that he ought to give that pocketbook

to the man who asks for it would remain uncontradicted in his mind. More than that, as all resistance fails, the hypnotized person would even associate all kinds of illusory reasons why it is better to hand all his money to the hypnotizer.

The state of hypnotization represents the climax of suggestibility. But there are many means far short of hypnotization which create milder degrees of increased suggestibility. Yet they may have considerable influence in forcing one man's intentions on the will of other men. If it were possible and legitimate to hypnotize everyone, even against his will, without medical reasons, business success might easily be attained, at least for the instant. The salesman would hypnotize his customer and would tell him that he ought to buy just this pearl necklace which he is showing him. The command to buy the costly jewels would be received as an idea which finds no opposite associations in the mind and which must therefore discharge itself in the act of buying the chain, while in the normal state of the mind at once the idea would arise that the purchase is too expensive or that it is a superfluous luxury. These antagonistic ideas would be strong enough to stir up the opposite action of refusing to buy. As a matter of course the customer cannot be hypnotized. And if, as has happened, an agreement to buy has been made under hypnotic conditions, it is a clear act of fraud which has only criminal interest.

Practical Uses of Suggestion

This does not mean, however, that the merchant has to abstain entirely from such suggestive influences. If we consider an entirely cool and indifferent offering without any effort to influence the mind of the customer as the one extreme and hypnotization as the other extreme, we must

recognize that there are very many steps between them. Nobody has a right, because the one extreme of suggestion, hypnosis, is out of the question, to demand that therefore the other extreme, entire abstaining from suggestion, be carried out. We must not forget that suggestive influence from man to man is nothing abnormal or pathological.

Suggestion plays a tremendous role in every important sphere of social life. Education depends to a high degree on suggestion. The teacher must take hold of the child's mind so that the ideas implanted be accepted without arousing the opposite ideas. Politics and religion cannot be thought of without the working of suggestive energies. Nor would art and literature ever influence us so deeply if all were brought down to sober reasoning and arguing. The true artistic effect and the impression of poetry involve that suggestible state of mind in which the offering of the artist is received as a reality. But this is possible only if the opposite idea, namely, that all these stories and all these pictures are not true but are inventions, is entirely inhibited in the reader's and the spectator's mind. All the means of the artist's technique have the very aim to make the mind more suggestible and to prepare it for the acceptance of the illusory truth which the book or the painting suggests. Hence if the poet and the artist, the politician and the minister, the lawyer and, above all, the educator, must be expected to exert suggestive influences, it cannot appear wrong for the salesman or for the advertiser or for anyone who aims toward practical success in the world of commerce and industry to make reasonable use of the powers of suggestion.

Suggestion in Salesmanship

The salesman's aim is indeed to influence his customer's mind in such a way that the idea of the purchase

does not find the opposing forces overwhelming. From all the preceding discussions we understand now that this alone is the point. The aim is not to connect the idea of the purchase with the appropriate action, because we have seen that this connection exists in the mind nerve-system anyhow. The idea has the natural tendency to express itself in the fit-action. No special initiation by a will behind the mind is needed. But this action is not performed because opposite ideas of saving our money or of seeking some more suitable goods or of disliking the offered wares or of postponing the purchase have still stronger effectiveness on the system of possible actions. Nothing is necessary but to suppress those rivals, and to do that three ways are open. One way is to strengthen the suggestive power of the idea by re-enforcing it; the second to weaken the opposing idea directly by undermining it; and the third way is to heighten the suggestibility of the customer and thus to strengthen the suggested idea and to weaken the opposite idea indirectly through the suggestible attitude. All three methods can easily be combined.

If we think first of the case of the salesman, the method of re-enforcing the proffered idea of purchase can be applied in many forms. Everything which is said in praise of the goods works in this direction. The praise can be linked with any appeals to the feeling of interest of the personality. If it can be shown that it would add to the distinction of the buyer or to his health or to his social standing or to his safety or to his amusement, or that it would give especial pleasure to those for whom he buys it, the feeling elements will strengthen the appeal. But the same effect is reached by bringing the offered goods strongly into the focus of his sensory attention. Then the salesman shows the article in different

positions, prepares a background which by the contrast brings it into striking effect or displays many similar objects so that each may support the effect of the others, and pictures the pleasant consequences of its use. Skillful movements can aid this effort. They help to concentrate the mind on the one thing while careless, scattered movements of the hands draw attention hither and thither and diminish the effectiveness of the proposition.

The negative effect by which the opposing idea is to be weakened is also reached directly by associations. The idea of the great expense of any rival article, or of its dangers to health or safety, or its lack of fashion or charm, can be pointed out. But here too the sense effect must be considered. As soon as the purchaser's attention is more or less focused on the one object which he is probably to buy, it would be a mistake to show him any others which would oppose that first impulse and would weaken it. Any interfering impression must be eliminated.

But the chief effect may be expected from that third factor, the increase of suggestibility. Everything which awakes a feeling of sympathy, of personal interest in the speaker, of bodily comfort, of harmony with the surroundings, of trust and instinctive confidence, heightens the suggestible mood. On the other hand, whatever irritates must decrease the suggestibility. The customer in a comfortable chair in cosy surroundings in a store which suggests harmony with his particular standards of fashion, served with politeness, easily enters into that state which lies midway between indifference and slight hypnosis. It is a mood of readiness to receive propositions to action and to inhibit all opposing ideas. The voice, the words, the manners, of the salesman will contribute greatly to this resetting of mind and nervous system.

True hypnotism is secured by monotonous sounds, slight strain of converging the eyes, soft touch sensations, and so on. The effect probably results from a contraction of blood vessels in certain parts of the brain. In a quite similar way the mild, insistent, somewhat monotonous words of the clerk can affect the listener. The comfortable surroundings produce moreover a general relaxation which also strengthens the suggestibility.

There are, however, individual differences, and the skilled salesman will become aware of the best point of attack in his effort to increase the suggestibility. Many minds are easily captured by a certain enthusiasm of the speaker which forces on the hearer an imitative impulse, and the more he is carried away the more he loses the power of resistance and enters into a state of increased suggestibility. The personal element is most effective among the means of awaking sympathy. But again individual differences must not be disregarded. An air of confidential intimacy is very impressive to some, and awakes almost negative suggestibility in others. The attitude of superior wisdom breaks down the resistance of ideas with not a few, but may irritate other types of minds. Good-natured humor seems to have chances with the greatest number. The skillful salesman will not only make use of all three methods, re-enforcing his suggestion, breaking down the counter-suggestions, and strengthening the suggestibility, but he will in every case recognize the particular methods which appeal to the individual customer.

It is evident that such methods can be misused, and the psychologist who describes the mechanism of efficient methods would overstep the limits of his function if he were to advise the use of such schemes without reserve. But the business man knows anyhow that it would be poor

psychology to misuse the method of suggestion for a sale of goods which awakes regret when the spell of the increased suggestibility is over. A good sale must always be equally in the interest of buyer and seller. But within reasonable limits skillful suggestion does indeed help the buyer. Moreover the psychologist's interest is not confined to the methods which make suggestions effective, but turns also to the methods by which the buyer may protect himself against purchases for which he will be sorry afterward. In a time which favors personal waste and ostentation, it is surely a very important psychological problem how to strengthen the mind against the temptation which the displays and the suggestive effects of the stores offer to the population. But to understand well the mechanism of suggestion means to understand at the same time the mechanism of the checks upon it.

Suggestion in Advertising

Every advertisement in a sense repeats the methods of the salesman. To be sure, the salesman has the advantage of a successive development of various stages and of an adjustment to the responses of the individual purchaser. On the other hand, while the salesman appeals to one, the advertisement may reach millions. Everywhere it has to awake the impulse to buy and can strengthen this impulse by every means which aids the suggestive power of the proposition and strengthens the general suggestibility. It is well known that even such simple devices as the imperative form of an advertisement can force the suggestion on a reader. But when such forms become standardized, they lose their effectiveness and new methods must be sought to give to the offer that inner force by which the opposite ideas are inhibited in the reader's mind. No doubt, repetition, enlargement,

pictures, colors, borders, skillful appeals to prejudices, emotions, and interests, can all be helpful in the re-enforcement of the suggestion. To make the action easy is another well-known little aid. The coupon to be cut out from the paper and filled in is typical of this group of practical schemes. It removes the resistance which the laziness of the reader may offer to the impulse to buy, and at the same time focuses the scattered impulses in one definite direction.

Self-Suggestions

As a last word concerning suggestion in practical affairs, it may be emphasized that we can give suggestions to ourselves. What we really mean by such autosuggestions is however not only that we are the givers of the suggestion but that by our own effort our mind is brought into a state in which our own plans of action become unusually effective. Under ordinary circumstances our will-intention may map out a piece of work, but when it comes to action opposite motives may be stronger. We may have planned to do some extra work in the evening and to stay in the office with the ledger over the dinner hour. But in the evening the appetite for the meal works as a stimulus in the contrary direction or we are thinking that we might go to the theatre. The idea at first creeps into the mind and awakes a feeling; the feeling strengthens the idea; and finally it reaches such intensity that the impulse to leave the office becomes stronger than the impulse to fulfill the plan which we had made out a few hours before. If someone had hypnotized us at noontime and given us the suggestion that we stay through the evening at our work, that desire for the theatre or the meal would have been inhibited, the proposed plan of

action would have overwhelmed every opponent in our mind, and we should have willingly staid.

Instead of being hypnotized or instead of receiving any influence which might increase our suggestibility from without, we can exert such an influence on ourselves. We can do it in the form of a firm resolution, like a pledge given to ourselves. Such a resolution is a resetting of our mind, an opening of certain brain paths and a closing of others, and the effect is exactly that of hypnotization, namely, a greater readiness to carry out one group of propositions and a greater power to suppress the opposite impulses. If we had given to our minds that shock of firm resolution at noontime, the little discomfort of appetite and the little desire for the theatre would not have reached our attention at all. They would have remained in the outskirts of consciousness; they would have been sufficiently inhibited not to overcome our resolution to stick to our work.

But a similar result might have been reached in another way which has still more the character of hypnotization. Instead of stirring up the mind and creating a resetting by the resolution we can lull our mind into a kind of vague, half-dreamy state. As soon as we produce such an almost sleep-like condition, we must say to ourselves that we shall carry out this or that action. If we repeat this inner promise several times, it sinks into the deeper stratum of the mind, gets hold of our inner setting, and gives to our later actions an energy which they would not have possessed without this artificial help.

The minutes just before sleep comes in the evening are especially favorable for such autosuggestion. Especially men whose will-energy is weak and who do not succeed in their business life because they lack energy may profit from such autosuggestions in a mental lull. Yet normally

the way more to be recommended is that of the sharp inner resolution. It is wise indeed not to leave every struggle of will-impulses to the decisions of the moment but to fortify one's own will beforehand by such definite pledges which give strength to the personal character and make the overcoming of distractions and temptations easier.

TEST QUESTIONS

1. What is meant by a suggestion?
2. How do fatigue, credulousness, and intoxication affect our power of control?
3. Why are some men particularly subject to suggestive influences in a court room?
4. Why do many judges and clergymen continue to wear robes?
5. What is hypnotism?
6. Enumerate some practical uses of suggestion in business affairs.
7. What is meant by "the idea of an act resulting in that act unless inhibited by an opposing idea"? Of what practical importance is this to a salesman?
8. Why should the consumer understand something of the laws of suggestion?
9. How can a man use autosuggestion to increase his efficiency?

CHAPTER XII

THE ACQUIREMENT OF ABILITIES

Physical and Mental Unity

Business life is activity, and every activity beyond the immediate automatic movements must be learned. How far can psychology contribute to an understanding of the best methods to acquire the ability for effective action? But here especially we must not forget that no sharp limit exists between the bodily and the mental actions. The contractions of muscles are more prominent in some activities than in others but there is never any activity which does not contain both bodily and mental functions. The workingman who, to feed a machine, has to learn a complicated co-operation of foot and arm and finger action is more conscious of this bodily element than the bookkeeper who adds figures or than the salesman who explains the qualities of his goods. Yet even in these cases it is not enough to point to the muscle contractions in writing with a pen or in speaking the words. No, the adding of the figures themselves or the choosing of the right arguments is a personal activity which concerns mind and body together.

The laws and rules which control the acquisition of abilities are therefore practically the same for the so-called physical and the so-called mental operations. We must learn how to serve customers or how to administer a shop or how to manage a railway according to the same principles of learning and training as those which govern

the study of typewriting or telegraphing or weaving. And these again are hardly different from the methods by which the child learns to walk, to talk, to read, to write.

Learning by Repetition

The whole process is in every case complicated. We may consider first one element which enters into the learning process every time, but which surely is not in itself sufficient. It is only one element, but an indispensable one. *All learning needs repetition.* To repeat the process frequently is the chief condition for the acquiring of a reliable ability. Offhand we might say that if we perform a movement we can do it more and more efficiently the more often we repeat it.

A definite experiment may indicate the character of the effect. A weight of three pounds was lifted with the middle finger once a second as long as possible while the other fingers were held immovable. The ability to lift it showed an average of 48 in the first week, in the second of 60, in the third of 86, in the fourth of 116, in the fifth of 136. This result of repetition is not lost by a pause. When the experimenter had reached this effect of training after five weeks he interrupted his exercises for three months. When he took up the movements again, the average of the first week was then not at the low level of his beginning, but was at once 95. The training was carried on again for ten weeks, and again interrupted for three months. The third period began at once with an average ability of lifting the weight 105 times, and seven weeks later the power to lift the weight 186 times was reached. A fourth period began with 169 and climbed quickly to 192. The gain which repetition of movement brings is thus carried through periods of months of rest with relatively small loss.

Influence of Repetition on the Nervous System

Such movement experiments are important for us because gain and loss are not to be sought in the muscles themselves but distinctly in the nervous system. The brain centers which control those finger movements are alone responsible for the effect of practice. They become trained by the repetition. It is therefore not surprising that similar experiments have shown that the effect of repeated action is carried over to the symmetrical muscle groups of the other half of the body and also to neighboring muscles. In lifting the weight with the middle finger of the right hand the middle finger of the left hand gets its training, because the brain centers of the two corresponding organs stand in immediate relation. Any systematic training of one muscle group is therefore to a certain degree a strengthening of all. To be sure, the experiment demonstrates that this is true only within certain limits. If excessive efforts are demanded for a particular muscle group the one-sided training of the one brain center saps the energy of others and ultimately decreases the power of the other motor parts of the brain. The important point for us is that repetition of action improves the ability to perform it and improves it by training not the muscles but the nerve paths in the brain.

The same laws which control the simple motor impulse for the lifting of a weight are therefore efficient also where a more complicated task is demanded from the nerve centers. A careful investigation, for instance, traced the learning process in tossing and catching balls. Two balls were kept going with one hand, one being received and thrown while the other was in the air. Six men took part in the experiment and the programme consisted of ten trials, the subject in each case continuing

the throwing until he failed to catch one or both of the balls. In such a complex action in which a general co-operation of almost all the muscles of the body is required the conditions of success are much more variable. The result showed one phenomenon which can be found in all such learning experiments, namely, that the progress is at first slow and then quicker, until the highest point of efficiency is reached. But experiments of this type, just because they are extremely complex, allow us at the same time to see the manifoldness of conditions under which our central nervous system works.

The increasing ability means here not only a training in the right combination of impulses but a growing ability to exclude wrong movements and to avoid mistakes. The individual learns to eliminate unfit chance movements or to avoid inappropriate positions of the body by which the tossing or catching of the ball is hindered. A certain definite combination of impulses is slowly developed. The result is that the improvement is not a perfectly steady one, but if it were plotted as a curve it would show irregular interruptions. A new combination of the nervous paths is formed and at once a definite improvement becomes noticeable. For this reason it is not surprising that a certain improvement may set in even in periods of rest. One of the experimenters, who after two weeks of training reached an ability to make 195 correct tosses in one series, gained the power to make over 300 tosses shortly after four months of complete rest. As soon as the right hand had acquired the ability in high development, the same experiments were made with the left hand. Originally the achievement of the left hand was, of course, far below that of the right, but after the training of the right hand the left hand showed a power to toss and catch far superior to that which the right

hand had shown in the beginning. Moreover the training of the left went on much more rapidly.

Conscious Effort Required in Repetition

Experiments of this type contain another suggestion which is very important for the learning of industrial activities. They indicate that improvement is gained only from repetitions the success or failure of which can be noticed by the acting person. The mere frequent performing of the action itself is no condition for improvement. The individual learns only if he becomes aware of the mistakes and makes an effort to adjust the setting of his mind, that is, of his brain centers, in accordance with the results. Where this is not the case, the unsuccessful repetitions are directly destroying the desirable setting. The ideal improvement results therefore from repetitions of successful actions only.

One of the consequences is that repetition is no help to the acquisition of ability as soon as a certain degree of fatigue is reached. The fatigued mind may still be able to give the motor impulse for the action, but is not able to give attention to a careful valuation of the outcome. The fatigued mind hardly discriminates between the perfect and the poor movement, or at least it does not adjust itself to the unsuccessful movement by an inner change. It does not profit from the mistakes. As soon as perfect nervous connections for an action are developed, the performance may be continued even in fatigue. But the learning process ought never to be carried to a degree of fatigue in which the mind has become indifferent to the successful or unsuccessful performance. Mechanically to carry on the repetition through such a state of mental dullness means rather to harm than to further the newly acquired ability.

Avoid Exceptions in Repetition

If the effect of repetition is dependent entirely on the easier connections of nervous paths, it is evident that a good training demands the avoidance of exceptions. The formation of nervous habits must be made more difficult if from time to time wrong connections are used. The psychologist can give to the ambitious pupil no more earnest advice: Never allow exceptions. It is the only way to make learning easy. As soon as a set of actions in response to a given stimulus has become habitual, every difficulty is overcome. It is the exception which interferes with this settling of habits. In a moment of laziness or indifference it may appear easier not to undertake the standardized action, but once yielding to such a feeling means to break down the connections which have been formed.

This is true not only of definite movements needed for a technical purpose but even for complex actions of general behavior. If we train ourselves to pack away everything on our desk before we leave the office, or to put all the tools in the workshop in their places when we are through with the work, or to answer the letters of the morning before night, or to speak politely to the customer, or to carry a part of the week's earnings to the savings bank, every new realization of such a plan facilitates the next performance; every breaking of our rule, every case of disorder or impoliteness or squandering, disarranges the mental connections and creates a resistance for the next occasion. It is much easier to do our duty always than to do it usually but to allow occasional slips. If we discipline ourselves for regular performance of accurate work we create conditions in our own personal system by which the task before us is made much easier.

Repetition in Acquiring Different Habits Side by Side

The demand not to disturb the formation of habits by exceptional wrong nerve impulses is not contradicted by the fact that different habits can be developed side by side. If we learn to respond to a certain situation by one kind of action, this does not interfere with the training for an entirely different kind of response. A very simple experiment may demonstrate the situation. I was accustomed to carry my watch in the left vest pocket. On the first of a month I put it into my right trousers pocket and wrote down the number of false movements until I became accustomed to the new activity which was necessary to see the time. In the first days many wrong movements were made or at least started, then fewer and fewer, until I was accustomed to the new position. On the first of the next month I replaced the watch in the left vest pocket and noted how often I made the wrong movement to the right trousers pocket. Less practice was needed this time to reach the point at which no mistakes were made. Some traces of the old habit had accordingly remained in the nervous system. I repeated this change to and fro from month to month and the result was that both habits constantly grew stronger and both finally became automatic. After the fourth change there were no wrong reactions at all.

I made similar experiments with inkstands on my writing table, during one period having ink in the right inkstand, during the other in the left. And finally I experimented with two doors from my study to the hall, keeping one or the other locked alternately and noting the number of wrong movements. It became evident that the tendency to two such different movements in response to the same will-idea can become equally mechanized in

our nervous system so that each can be carried out as soon as the right signal is given without any interference from the other. This is the reason why we can master two or more languages with equal ease. The same thing before us or the same situation may give us in one moment the impulse to speak the French words, in another situation to answer with an English or a German or a Spanish phrase.

Thus no activity demands a narrow one-sidedness. Efficient training in one system of action never excludes thorough training in another system, even if they partly overlap or have common starting points. Practice does not involve narrowness. Concentration and repetition in one line go well with training in another. But it is easy to understand from all which we have discussed that the two groups of movements to be learned will interfere less with each other if they are not too similar. It is easier to learn piano-playing and violin-playing at the same time than to learn violin-playing and violoncello-playing. The technical worker too will master with less effort the technique of two very different machines than of two machines which are partly alike and partly different.

Organization of Complex Habits

The experiment with tossing and catching the ball suggested to us that the learning of a complex movement includes more than the mere repetition of a special impulse and muscle contraction. The factor which is not less essential than repetition is the organization of movements. A systematic organization is indeed the chief help toward the upbuilding of a practical habit. To write with a pen involves endlessly more than the ability to make straight downward movements with the pen or

upward movements or loops or hooks or dots. Each of these little part movements of writing had to be tried and tried by the child until through repetition a definite ability was secured. Yet the essential step forward was the organic combination of such part movements into complex groups until one mental impulse could release the motor energy for all the muscle contractions needed for the writing of one letter.

But even when the child, in its early writing efforts, had learned to organize these single finger movements into the complex movement needed for a whole letter, the end of the learning was not reached. The letters themselves had to be organized into the complex unit of the word, and the chief task of the writing lesson was the acquiring of this higher habit in which an idea can express itself in that whole organized group of movements needed for the writing down of a word. The adult person, well trained in the use of the fountain pen, is no longer aware of the single letter, but gives the impulse for the word as a whole. The same, of course, is true of reading. We respond to the optical impression of the total word with the speech impulse for the whole organized group of letters.

These simple cases give us a clue for the acquiring of complex technical habits in commercial and industrial life. Everywhere we must resolve the complex task into its elements and must learn to perform the elementary actions, especially through imitation. Then we must train ourselves in each of these elements until by repetition the functions become easier and easier and finally find no resistance. As soon as such various simple functions have become mechanical, they must be grouped together into a higher unit which at first absorbs the full attention. This complex action is then learned again by

frequent repetition until it becomes just as automatic as its elements originally were. At that stage it can itself with other such automatic responses enter into a group of still higher order. Whatever our daily work may be, we are usually no longer aware of how many part-actions are automatically combined in the performance of our duties. As every new ability by which a group of movements has become mechanical allows us to turn our attention to further goals, we forget how long the process was by which we had to learn the correct carrying out of the simpler movements and their combination.

Reaching the End by Distinct Steps

The development of such richer activities can easily be traced in much detail by laboratory experiments. We possess, for instance, an accurate investigation into the methods of learning to use the typewriting machine. Each key of the machine was provided with electric contacts, and it became possible to register by this contrivance all the movements and to measure the time between them. It was found that the process of learning consisted first of a steady elimination of unfit movements, a selection of appropriate impulses and their reorganization, and finally a combination of these into processes of higher order. But the most characteristic features are the irregular periods in which the learning itself seems not to make any progress. Such intervals of apparent rest may cover a month or more in spite of daily practice. But as soon as we analyze the process more in detail we see that just these periods are essential. They represent the time in which one stage of organization is reached and the next has not yet been started, because the old one is not sufficiently fixed by training.

At first the student of typewriting has to form the elementary connection between the single letter and the movement toward the particular key. This needs training for quite a while until an entirely new impulse can be organized, namely, the impulse which combines the movements for a number of keys, until finally the idea of the whole word is sufficient to release the movements for writing it. Similar results have been found in the careful experimental analysis of the processes needed in telegraphing, both in sending and in receiving. The lowest connection refers here also to the single letters. As soon as the apprentice has mastered them, he steps forward to syllables and short words. These again need a long period of training until everything is so completely automatized that a still higher stage can be reached, and whole phrases can be grasped by one personal act.

Even the simplest technique of the artisan or factory worker can be resolved into simpler parts and can be mastered fully only if the final product is built up from the more elementary processes. The more the single processes are mechanized by repetition, the more successful the organization will appear. On the other hand even the most complex and apparently irregular and highly personal activity of the man at the top can greatly profit from the application of these principles. The work may appear far beyond all routine technique, controlled entirely by the inspiration of the individual; and yet it could have been greatly helped by a planful organization of action.

Even in the very highest type of work, such as the responsible administration of great industrial or commercial undertakings, large groups of facts remain always the same. The more the responses toward these groups are trained and have become automatic, the more

it is possible to include them in larger groups and to organize them. To learn to write shorthand or to drive a motor car or to typeset with a linotype machine is in these respects not different from acting as floorwalker in a department store or as superintendent in a mill or as president of a trust. The capacity for organizing mechanized responses in new combinations is of course individually very different. Everybody can learn to toss and catch one ball; not everybody is quite as successful with two; and very few really learn to throw three balls with one hand. But the principles of learning are in all cases the same. It is not different when experience shows that not everybody can learn to handle successfully a great administrative organization.

Keeping the End in View

Only one further consequence ought to be drawn; and much waste and much disappointment results in the business world from the neglect of this principle. We said that a complex movement must be systematically built up. The stages of learning must follow one another so that every new one is really prepared for by the foregoing one. The chief condition for full success is therefore that the apprentice be taught to approach the task with a view toward the final stage. Practical life tends to lead in a very different direction. The beginner is usually tempted to ask not how the whole process can be slowly built up but how to reach most quickly a certain end-effect. He uses some short cut and is satisfied if he can quickly see some results. As soon as such tolerable results are reached he tries to improve them by frequent repetitions and training and he is unaware that his method may be entirely unfit ever to lead to the greatest efficiency.

A familiar illustration is the learning of typewriting. If a beginner is left to himself, he invariably picks out the keys with the two forefingers. That gives him the advantage of writing at once with a certain rapidity. Yet he will never rival those stenographers who learned from the beginning the touch system, using all ten fingers on the keyboard of the machine and being able to keep the eyes on the shorthand copy while the two hands are writing. It is, of course, far more difficult to learn this complex motion of the ten fingers. This demands a slow organization of movements, but in the end it is the only method to secure the greatest possible speed. Moreover, as soon as it is mastered, it needs not more but less mental effort to write with this better organized method. This case is in every respect typical. All the haphazard methods of learning are dangerous, and the desire to produce quickly a result which somewhat approaches the end in view is almost always misleading. In many fields, to be sure, the slow procedure of trying and trying again may be sufficient ultimately to produce satisfactory results. But in most cases such self-help will never lead to the ideal end.

The only safe method is to start with an analysis of the best possible scheme and then to force the beginner to go through all those slow ways of training by which this best possible method can be built up. His first steps may appear entirely useless, because they seem not to lead directly toward the end at all. He may have to learn at first partial actions which in themselves yield no results but are necessary to prepare for the more complex actions which finally yield the best possible results. The chance efforts of the beginner who is left to himself or left to the guidance of a teacher with haphazard methods may easily become the worst obstruction in the forward path.

Bad habits are acquired which interfere with the later training in better procedures.

The Value of Standardization in Industry

The psychologist cannot too seriously advise the introduction of carefully chosen standard methods for the learning of every complex commercial and industrial activity. In the schoolroom our time has become accustomed to have the methods of teaching under safe control. In earlier times it was considered enough that a teacher knew how to read and write and use English grammar and to calculate. It was left to her to teach by any chance method the things which she knew how to do herself. Today the teachers profit from a large amount of work devoted to the study of the best teaching methods and in special educational courses they learn the best possible steps toward the development of the various activities in the child.

The pedagogy of commerce and industry is still very little developed. Especially in the mills and factories, but also in the commercial houses, each man picks up the details of his work in an accidental way. The apprentice depends upon the so-called common sense and experience of some foreman, and his learning too often begins at the wrong point. Mediocre results can generally be reached in many ways, but there is usually only one way to reach the best possible results and it is highly desirable in the interest of true efficiency to make sure beforehand which this perfect method is and to subordinate every act of training to the acquisition of this one best scheme.

As soon as the development of the best methods is more thoroughly considered in business life, it is evident that a much greater standardization must result than the past has seen. To standardize business methods does not at

all mean to make them monotonous and to deprive the work of spontaneous freshness and personal inspiration. It means only wherever possible to remove the obstacles, to decrease the friction, and to give to the individual convenient tools with which he can work to best advantage. This is in no department more neglected than in the sphere of selling activities. While the technical methods of the mills and factories and even the procedures of the artisans have become more and more standardized, the buying and selling are mostly still left to very primitive methods which every salesman has to work out for himself. There are no traditions and no regular forms. The same question may be asked in a department store a thousand times; and yet the salesman has to work out the answer from his own mental resources every time anew. He has not been trained in a carefully prepared technique of replying. The forms in which the goods are to be demonstrated and the ways in which the customer is to be met have to be chosen anew and to be worked out afresh in every instance by the mental energies of the employe.

Only some pioneer companies have undertaken to standardize the selling processes too and to train the traveling salesmen or the men in the store in the application of those methods which by careful analysis have been worked out as the ideal ones. A hundred salesmen who have to demonstrate a new article may do it in a hundred ways, but a few of them are much superior to the rest. If those best ways become prescribed and everyone is systematically taught to organize his selling action according to the standard method, it will mean an immense saving of energy and time with a vast increase of effectiveness. Only the method which is really standardized and systematically organized can be learned, and learn-

ing means to profit from the experience of all others. To make everyone begin at the beginning for himself is the most wasteful method and a method which in most cases will never lead beyond mediocre results.

TEST QUESTIONS

1. How does repetition aid in the acquirement of abilities? Does this apply in the mental sphere as well as in the physical?
2. Why does muscular dexterity depend upon nerve co-ordination?
3. Give an illustration to show that development consists not only of a training in the right kind of impulses, but also in ability to exclude wrong movements and avoid mistakes.
4. If you were training a person in some industrial activity, how would you attempt to secure his conscious effort in the acts of repetition?
5. Why is it important to consider the fatigue factor in learning by repetition?
6. What is the consequence of allowing exceptions to creep into the processes of learning by repetition?
7. What is meant by "organizing one's movements" in learning by repetition?
8. Explain all this in relation to learning to write on the typewriter.
9. What is the importance of this chapter for the subject of standardization in industry?

CHAPTER XIII

THE OUTER CONDITIONS OF EFFICIENCY

The Services of Psychology

One very important condition of efficient activity has been the topic of our last discussion. Indeed the actions which constitute business life in the case of the highest employer as well as those of the least important employe cannot be carried out well unless they have been learned well. But the learning and training and acquisition of the necessary ability are after all the preparation only for the daily work as it is performed in the workshops and offices of the country.

The central problem of this great and important subject still needs an answer. How can psychology help us to protect and improve the work of those who are by their training prepared to earn their living by their activities? Of course the wish to improve the work is in itself no definite programme, as improvement may turn in many directions. The employer and the employe may have very different ideas as to what means a real improvement. The mill-owner may consider as the best work that which produces the largest possible output. The workingman on the other hand may consider a real improvement only that change by which, without decrease in the output, his personal energy and health are protected as well as possible and his happiness and comfort secured.

But the employers themselves may have very different wishes even if they do not accept any but an egoistic

point of view. They may be in doubt whether the best method is one in which the greatest quantity of output is insured or one in which the highest quality is brought forth. Others would recognize that even their selfish business interest earnestly demands that the welfare and comfort of the employes be made a concern of theirs. They recognize that the health and happiness of the workingman really increase the income of the factory. The psychologist is hardly called to play the judge in such social debates. He studies only the laws of the mind and can therefore predict that a certain effect can be reached from certain mental causes. But he has no right to decide which effect is good and which effect is bad. Yet he certainly should not subordinate his advice to selfish fancies of either side. The ideal to which he has to make his psychology serviceable must always be that of the social community which respects equally the demands of the employer and of the employe. Without partiality he must ask what psychological facts ought to be considered if the aim is to make the commercial actions as efficient as possible in the interests of both employe and employer.

Adaptation of Working Tools

We may begin with the outside factors. Almost every commercially important activity is related to physical tools. It may be hammer and chisel and saw; it may be the tailor's needle or the mason's trowel; it may be a printing press or a loom or a locomotive or a harvesting machine or a steamboat. But whether we use a fountain pen or a dynamo for our daily work, the technical object must always be related to our muscle contractions, and those muscle contractions are dependent upon our mental motor impulses. We have to make the impulses in accordance with the instrument. Yet these impulses re-

main dependent upon the abilities, characteristic traits, and limits of our mind. An instrument, for instance, which would need mental impulses so rapid or so complex that our mind could not furnish the necessary will-actions at all would be useless. A machine on which we would have to press a lever with our finger twenty times a second would have no technical value, as no mind can push the finger so rapidly. Even the piano virtuoso can trill only twelve times in a second.

But if it is evident that the mind thus sets limits and, we may add, narrow limits, to the technical possibilities of the instruments which we are to handle, it follows that the technical devices to which our mind can adjust itself must be more or less fitted to our mental system. A machine may be constructed in such a way that we can handle the levers in the right order and with the necessary speed, if a strong effort keeps the attention at the highest pitch and if we are ready to pay for it with great exhaustion. Yet it may be that the same economic effect could be reached if the machine were rebuilt, the levers arranged otherwise, so that the necessary mental impulses could be given with ease and without fatiguing exertion of the mind. The engineer is too easily inclined to consider only the physical chemical needs and to improve the machine merely with regard to its mechanical capacity, but to give little attention to its adjustment to the mental conditions.

Psychological Adaptation of Tools

Of course common sense is not sufficient to decide what changes in the physical apparatus from the simplest tool to the most complex machine are really best adapted to the physical conditions of the average user. To answer such a question in the concrete case demands just as much

careful and painstaking laboratory research as any investigation concerning the greatest working power of a machine in a technical institute. Even the mere subjective impression of the workingman ought never to be decisive. Ever so many psychical illusions enter into play there. He may feel that one kind of technique is more convenient or more comfortable or easier than another; and yet the objective examination may show that it fatigues him more or that the outcome is in other respects less satisfactory. The ideal of this modern movement is distinctly the establishment of special psycho-technical laboratories more or less attached to the great industrial plants, and the development of the vocation of consulting psychologists who as mental engineers determine in the special cases how the working conditions of the particular technical apparatus can be best adapted to the purely mental needs and abilities of the average worker.

Least of all ought we to be satisfied with a tool or mechanical device simply because it has the sanction of tradition, and thus has apparently stood the test of long experience. Tradition has often tolerated very impractical methods simply because no one turned his attention to an exact study of the possible improvements. On the mental side the experience of the centuries has yielded more adjustment to the immediate feelings of comfort than to the actual conditions of the mental will-mechanism. How little mere common sense and experience are sufficient to shape the technical methods so that the greatest possible success may be reached has amply been demonstrated by the recent studies which the modern scientific management movement has called forth. The scientific management engineers under the leadership of Frederick W. Taylor do not go the ways of the psycholo-

gist. Their methods and their immediate interests are other. But it is very characteristic that they were able to show that even such an old vocation as that of the masons was carried on with tools which were utterly unfit to secure the greatest possible efficiency. As soon as the masons' apparatus was planfully adjusted to the psychological needs of the body, three times as much work could be performed as formerly under traditional methods.

Even the most trivial technical means may become very important, and slight changes may cause great economic differences, if the activity is widespread and frequent. It seems to be utterly insignificant whether a sewing needle is 1¼ of an inch or 1¾ of an inch long, whether the thimble is closed or open, whether thumb and first finger grip the end of the needle very near the point or not, and whether during the sewing work the left foot can rest on a low footstool. It would be trivial indeed if nothing were in question but one woman occasionally spending a few minutes with sewing work, but if millions of women sew all over the country and if in factories many thousands sew from morning till night day after day, it makes a tremendous difference if the one method meets the psychical needs better than the other and secures steadier and better work with less mental effort and fatigue.

The automobile-maker considers carefully the effectiveness of the various levers which the chauffeur has to put in action. He also knows very well that the possibilities are limited by the conditions of body and mind. Yet the subtler details for the arrangements of the brake and the clutch and the accelerator are hardly considered under the most essential point of view, namely, that of the needs of the mind. All speedy vehicles, the motor car

as well as the locomotive and the aeroplane, ought to be built so that an important difference of mental intention has to be expressed by strikingly different physical action. To stop a car and to speed it up are two functions which ought never to be released by the same forward movement of the foot, that is, by the same muscle contraction.

Individual Adaptation

In many cases the perfect adjustment would demand, above all, consideration of individual differences of mental habits and dispositions. We know how many kinds of typewriting machines are on the market and how certain advantages are claimed for every one. The truth is that these advantages always exist only for special minds. The single keyboard and shift key of the Remington machine is adjusted to an entirely different type of psychical system from that to which the double keyboard of the Smith Premier is suited. The technical arrangements for filing and sorting, like those in the post-office cars of the railways, are used by men whose mental differences would make very different types of arrangements desirable. Even the office furniture is too easily left to the judgment of the carpenter and perhaps a little accommodated to the feelings of comfort instead of being adjusted most carefully to the needs of the work. A chair one inch higher or lower may influence greatly the mental energy needed for the day's work and indirectly the quality of the output.

Rhythmical Action

The most important adjustment is secured where rhythmical action becomes possible. Rhythmical repetition is most favorable for social co-operation, as when-

ever several people have to act together the impulses can best be timed by a regular rhythm. But still more essential is the saving of energy which every single individual experiences by the rhythmical arrangement. The performance of each act then becomes a signal for the next and the mental motor energy for one movement lasts over the next and the following. In any irregular function each act needs a new mental preparation. In the rhythmical action a definite situation of the mind is reached in which the impulse for every new action is small compared with that which remains throughout the series.

Psycho-Muscular Adaptations

A further technical need suggested by the structure of the mind and body is a shifting of the work from the large to the small muscles. The mind can master the impulse more easily with less effort and with less fatigue and disturbing after-effect if the achievement can be secured with fingers instead of the whole hand, with the hand instead of the whole arm, with the arm instead of the whole body. The mental impulses for the smaller muscles can follow one another more rapidly, can change more quickly and the performance itself inhibits less the succeeding actions. Wherever a technical improvement allows the workingman to secure by a finger contraction what before needed the whole arm, a true advance is made in the direction of disburdening the mind.

Thorough investigations have shown moreover that the rapidity with which regular movements can be performed in the most exact fashion is very different for different parts of the body. Each muscle group has its own best speed for the most exact performance. The foot has a different rhythm from the leg or from the head or from

the wrist. But we must never forget that the exact speed for the most favorable conditions can never be discovered from the subjective impression of the worker himself. A rhythm for a special muscle group may be very comfortable to him, and yet the detailed experiment may prove that it is not the speed at which the rhythmically working organ produces the most exact repetitions. But as soon as the experiment has definitely made out what forms and speeds and combinations of actions secure the highest efficiency, the technique of the apparatus ought to be adjusted as much as possible and the movement ought to become completely standardized so that every individual must adjust himself to the prescribed style of work.

We demand that everyone spell the words of the language in the same way and we do not allow anybody to invent his own orthography. Moreover while it is difficult to learn correct spelling at first everybody who has mastered it in school knows that it is much simpler to be subordinated to such standardized forms than to invent his own forms every time he writes a letter.

Motion Studies

All the so-called motion studies which have been developed in the course of the scientific management movement belong in this sphere. Almost every complex movement which we carry out in the course of the day involves a waste of energy. The same effect could be reached with a simpler combination of impulses. We allow useless movements to creep in or to accompany the chief motions. We waste both energy and time. It would be pedantic even to wish that the actions of our practical life become reduced to the minimum requirement. It is quite in order that we waste. It would involve too much effort of thought and training and deprive us of many

comforts if we had to confine ourselves to the simplest motions which lead to our goal. Do we not also in our conversation use many more words than would be necessary to give the simplest and most precise expression to our thought? It does not harm us if we eat our soup and our steak with many superfluous movements. We want to enjoy the comfort of our meal. Even if we sit in our office and fold a few letters and put them into envelopes and close them and put them aside, we may have done so with many more muscle contractions than were absolutely necessary and we may have lost five seconds by our haphazard movements. Yet it would not have appeared worth while to study the best possible scheme of dispatching our letters in order to save five seconds.

How different is the situation if not a few letters are to be closed, but if the employer has to pay the wages of a dozen girls who have to fold two million circulars and enclose them in envelopes and make them ready for the mail. If only one second is saved on every circular the twelve girls would have to work a week less. That would make it worth while to study and to determine by experiment once for all how the motor impulses are to follow one another with the greatest possible saving of time and with the least possible fatigue. It may be that the new combination of movements is in the first half hour less convenient to the girls, but they will quickly be trained and will soon feel that the definite form of action once accepted saves much mental effort. To reach such a result it is necessary to analyze with exact instruments every single action into its component elements and to measure the time of these elements and the loss of time by their combination. Much of this motion study has been done with such simple devices as watches which measure in fifths of a second. More subtle work demands electric

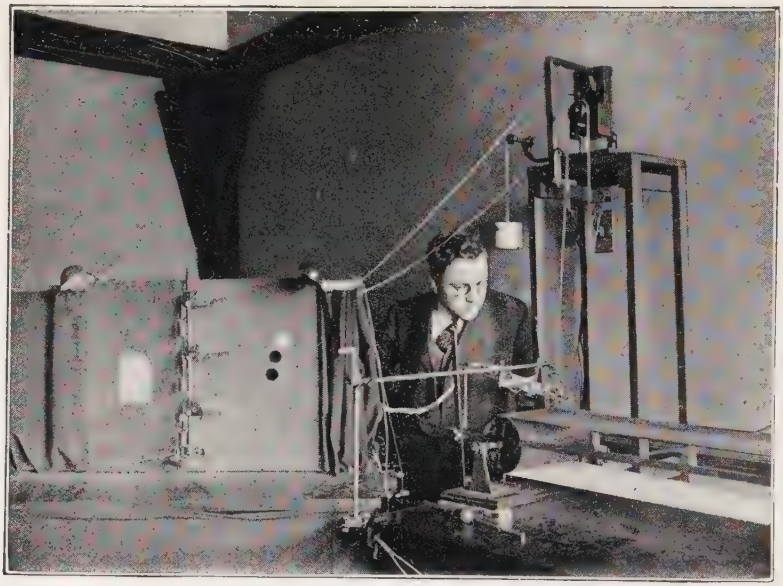
chronoscopes which show the hundredths or even the thousandths of a second.

Other studies of this kind may use methods of graphic recording. Take the case that the girls have to fold handkerchiefs in a mill. If they are well trained, their hand and finger movements are so rapid that they can hardly be traced. They themselves do not know in what order their movements are carried out. They rely on a habitual procedure which has been developed without special plan. It would be difficult to analyze movements of this kind without somehow making the elements visible. But let us put rings with small electric lights on the forefingers of the two hands and interrupt the electric current by a tuning fork device ten times a second. Then let us take a photographic picture of the motion throughout the folding process. The result is that the movement will be seen in the composite photograph as a dotted line of light points, ten points in a second. This dotted line is entirely jerky and irregular. On that basis we can study the possible improvements of motion, until that dotted line becomes straight and smooth and represents the simplest possible effort.

But closing letters and folding handkerchiefs are extremely simple movements. The motion study can proceed to more and more complex combinations of impulses. The question of individual differences must necessarily play a large role in it and the technique of the tools influences the whole situation. The psychologists have only begun to approach this field.

A Proper Environment

But the outer conditions which favor or hinder efficient work through their relations to the mind are not confined to the tools. The surroundings of the worker stimu-



This picture shows a part of an instrument used in applied psychology. The apparatus at the left allows signals to be given similar to those in railroad service. When the experimenter touches various keys, semaphores take oblique or vertical or horizontal positions, and red or green or white lights flash up.

At the other corner of the room, not visible in the picture, a subject sits in a cab similar to that of a locomotive, with all the levers of an engine. At the right side of the picture an endless smoked paper revolves over two cylinders and seven little electric markers record the moment in which the signals are given and in which reactions are performed. One of those seven markers writes fractions of a second.

With the help of this instrument it becomes possible to measure through periods of hours the times and the mistakes in any reactions on railway signals and to study the most favorable conditions for such work. The experiment is useful in determining the fitness of individuals for the vocation of a railway engineer.

late or inhibit his work. Everybody knows that he can do more in a moderate temperature than in great heat or in great cold, that he is more ready for hard work in good than in foul air, that he is fresher at his task in a well-lighted room than under poor illumination, that he can concentrate on his duties better in a quiet place than amid distracting noises. But mere generalities are insufficient and perhaps often unreliable. There may be mental illusions involved. Many a man also thinks that he can do better work after having taken several drinks of whiskey, and yet the exact measurement can easily demonstrate that the feeling of increased strength is deceptive and that in reality his work becomes worse. So the psychologist will never put his confidence in the vague testimonies of the worker himself, but will accompany his self-observations with exact measurements and determine with careful instruments the increase or decrease of efficiency under the influence of lights or sounds or smells or temperatures, and so on.

As soon as the laboratory investigator analyzes the facts, he can indeed trace subtle changes in our whole system of action in response to the various outside conditions. He may measure, for instance, the amount of energy with which he can press down a spring while he sees different colored lights. The recording instruments show that our will-impulse is much more effective when our surrounding is red than when it is blue. The red color stirs up the mind and brain to more forceful will-action. The technical term is "dynamogenic influence." The owner of a large cotton mill who has a number of centrifugal dyeing machines reports that the work is mostly with red and with black color and expresses his surprise that his workmen are always behindhand when they deal with the black material and never when they

deal with the red. Any psychologist would have foreseen that. Black is a subtle form of friction.

But most influences of this kind are today still beyond the control of the psychologists, because the researches have hardly started. We only know with certainty that no sense-influence ought to be neglected and considered as unimportant. The workman himself may assure us that he is not disturbed by the noise around him or by the bad odor. But subtle measurement shows that every time the big hammer falls down on the other side of the factory the noise does interfere with the mental impulses to his muscles and that the irregularity of those hammer blows decreases greatly his efficiency without his knowledge. The modern factory-owner has learned to value the importance of cleanliness and neatness and good light wherever men or women are working. He knows from experience how much better work is produced by employes whose senses are not maltreated by dirt and disorder. The harmony of the surroundings and their order have a harmonious influence on the whole mental physical mechanism of the individuals. Their impulses become better adjusted to one another, their actions better organized. Having the lights higher or lower may greatly change the output from the working force.

TEST QUESTIONS

1. How can psychology aid in determining upon the operating possibilities of a machine? Suggest a number of tests.

2. Are all your working tools and apparatus psychologically adapted to your own work?

3. How are these principles worked out in the automobile? In the typewriter keyboard?

4. Why does a saving of muscular energy mean also a saving of brain energy?

5. How is time and motion study related to this subject?

6. Why are impressions as to one's efficiency not safe guides without verification by exact measurement?

7. What are some of the conditions of environment that directly stimulate or retard activity? Illustrate.

8. What is meant by "dynamogenic influence"? Illustrate.

9. How could you get accurate results as to whether certain noises in an establishment are interfering with the efficiency of the workers?

10. How do cleanliness and neatness in a factory increase the efficiency of the workers within the plant?

CHAPTER XIV

THE INNER CONDITIONS OF EFFICIENCY

Nature of the Inner Conditions

The chief conditions of efficiency lie not without the organism but in the readiness of the mind brain-system itself. Even with the best adapted tools and under the most favorable outside conditions an overfatigued or an intoxicated or an emotionally upset mind brain-apparatus must produce unsatisfactory results. Needless to say, the disturbance of work must be greatest when the mind is diseased. We can ignore diseases here, and consider only the chief conditions for the normal mind. Halfway between outer and inner conditions we find the influence of the drugs, including alcohol. They come from without like the influences on the senses, like color and sound, but they are by their absorption into the body transformed into inner conditions for the action of brain and mind.

Effects of Alcohol

Especially the influence of alcohol on industrial efficiency has been an often discussed problem. But the real experimental material which has been gathered so far is still rather meagre. The laboratory investigation which is most often quoted in the interest of abstinence was carried on with typesetters. The men had to drink in the midst of their work a considerable quantity of heavy wine, and the effect on their typesetting was ex-

amined for the next four quarters of an hour. The most characteristic result was that the typesetters who took part in the experiment had a strong feeling that the wine had improved their ability to perform the work, but that the objective outcome was a decrease of their achievement. The average loss was 15 per cent, but it must be added that this loss through the alcoholic influence referred exclusively to the quantity and not to the quality. They were not able to set so many letters but the number of mistakes did not increase.

Such experiments with actual workingmen are, however, the exception as yet. Our real knowledge of the effect of intoxicants on the mental processes is based on studies which have no direct connection with industrial work. The experiments have been carried on with reference to ordinary functions, like reading, counting, discriminating, remembering, recalling, attending, and so on. All the experimenters agree that the ability to grasp and to understand the impressions of the surrounding is decreased, and the span of consciousness and of attention narrowed by any considerable doses of alcohol. Measurements with chronoscopes by which hundredths of a second can be discriminated show that the process of understanding becomes distinctly slower. At the same time the memory suffers. The ability to reproduce the material which was learned is reduced. The exactitude in the discrimination is lowered, the time estimation becomes poorer, the measurement of distance by the eye becomes imperfect.

These effects while not examined in actual industrial activities but under the artificial conditions of psychological workshops must be of significant import for commerce and industry. On the other hand acuity of vision is slightly sharpened by small doses of alcohol and motor

excitability is strongly increased. The brain which is under the influence of alcohol is more ready to discharge its excitements into actions. The motor impulses are more quickly released. But it would be very hasty to see in this greater preparedness for motor response a real advantage to the industrial work. While the movements are performed more quickly their exactitude and fitness suffer. The greater readiness for action is not an improvement of the mind brain-apparatus, but in reality a defect. It results from a certain inefficiency of those brain centers which inhibit the wrong movements. The result is that the brain responds frequently with incorrect reactions.

This is truly the real reason why chauffeurs, locomotive engineers, seamen, and men in similar vocations should never go to work under any direct alcoholic influence, as the inclination to wrong reactions in their case brings immediate danger to themselves and those who are entrusted to their care. It is this very disappearance of the checking influences through higher brain centers which gives them personally the misleading impression that they are doing their work with especial ease and comfort. Moreover the period of acceleration in the performance of action is soon followed by a period of retardation, and finally the energy of the will-action, that is, the mere physical strength of the alcoholized brain, is from the start less than normal.

It would be unscientific, nevertheless, to deduce from these facts the claim that industrial and commercial life demands by all means complete abstinence instead of temperance. The alcohol problem in its whole social setting is naturally much wider than its relation to technical work suggests. Questions of morality and criminality, of health and hygiene, are involved. We have no right to

follow up these interesting discussions here. But as far as mere commercial and industrial life is concerned, it ought not to be denied that the deductions in favor of complete abstinence are the results of a certain one-sidedness. Alcohol taken before or during work certainly reduces the mental ability to work, or, in other words, complete abstinence would surely secure to the workingman more efficiency than any drinking in the morning.

But that does not settle the question whether those adult persons whose nervous system is in good health do more wisely under the point of view of industrial efficiency to abstain from alcohol entirely or to use a small or certainly a moderate amount after the completion of the daily work. There is no doubt that even a glass of light beer after the work produces a decreased efficiency of the inhibiting centers in the brain. The field of the mind is somewhat narrowed and the attention reduced. But we have no right to take it for granted that that is a disadvantage. If this were the case sleep would be the greatest misfortune for the mind, as then the span of consciousness is narrowed to its minimum, attention is paralyzed and activities cut off. Yet we know that periods of sleep are the most necessary condition for efficient work in a waking state.

It may be distinctly useful for the total work of the healthy average workingman if in the evening he passes through a period of decreased attention and narrowed span of consciousness. The after-effects of the motor excitements from the day's work are eliminated by this counter-influence, the cares and troubles of the day are extinguished, and sleep is secured. We still know very little how these useful effects of small alcoholic doses after the day's occupation affect the total year's output. Strong doses of alcohol are ruinous in any case.

Other Stimulants

While the alcohol problem naturally stands in the foreground the mental effects of the other excitants are not at all unimportant for practical life. The more alcohol appears unfit to satisfy the natural demand of the workingman for excitement and refreshment, the more substitutes, especially coffee, tea, tobacco, and chocolate, demand attention. The sociable influence of tea, for instance, is well known. The effect of the tea on the nervous system and the mind can easily be demonstrated in the laboratory as an influence on the attention, the association of ideas, the motor excitability, the power of discrimination, and so on.

In all these cases the results are mostly complicated. It is not only the chemical substance in coffee or tea which changes the setting but also the aromatic smell-sensation has its influence. Very interesting experiments have demonstrated that similar elements enter into the alcohol effect. Small doses of alcohol do not produce the usual change in the mind when they are brought into the organism by a stomach pump, not allowing the subject to know whether he received alcohol or water. The smell of the alcohol has its suggestive influence. Moreover in the case of all beverages the secondary chemical substances may be of considerable importance. The same amount of alcohol may have very different effect on mind and body in the form of whiskey, beer, claret, or champagne. The same tobacco may bring different psychical results when smoked in different ways.

The most destructive results on the whole mind body-system must be expected from morphine and cocaine which in surreptitious ways nowadays so often reach those who abstain from alcohol. Here too illusory feel-

ings of freshness and readiness to work deceive the victim. More than with any other stimulants the brain cells demand a steady increase of the doses used. Whatever a man's place in commerce or industry may be, as soon as he begins a regular use of cocaine or morphine, he can be sure that he will have to step out of it very soon. The longing for the satisfaction is so overwhelming that the mere good-will and thought of dangerous consequences cannot balance the abnormally strong impulse. This quickly leads to the habitual taking of such amounts of the poison that brain and mind become unfit for organized work.

Fatigue

While drinking and smoking can easily be avoided, another disturbing influence cannot be entirely eliminated from the work, namely, fatigue. As soon as the mind brain-apparatus suffers from fatigue, the efficiency of its will-achievement is decreased. Both employer and employe have the greatest interest to reduce the weakening influence of fatigue to the least possible amount. But the word "fatigue" refers to a number of changes which are to a certain degree independent of one another. We must separate the subjective feeling of fatigue from the objective decrease in the ability to produce work. Moreover both the subjective and the objective processes can refer either to the muscles themselves which are used during the work or to the mind and brain. The feeling of fatigue in the arm is very different from that of exhaustion of the mind in which the man feels unable still to contract the arm. But even in these mind brain-states of fatigue different functions may be involved. The attention which is directed toward the work may become obtuse, or the discrimination of the sense-impressions

may have suffered from fatigue, or the association mechanism may be out of gear from exhaustion.

Experiments demonstrate that any one of these detrimental changes may arise without the others. Especially the feeling of fatigue can grow strongly without a real decrease in the strength of the rhythmical motor work and still more frequent is the opposite case, namely, that the physical work suffers strongly from the objective fatigue of the nerve centers without a distinct subjective feeling of fatigue. It often happens that the decrease in the nervous energy which shows itself in the poorer work is combined with a state of increased excitement and that this excitement inhibits and overshadows the feeling of fatigue.

Rest Periods

The most natural counter-influence is the interruption of work by pauses. But just with reference to these recesses, it is important to discriminate among the various forms of fatigue. The chief difference is this: If the fatigue is only the result of the chemical products which gather in the muscle from the long action of the organ, a short rest will be sufficient to overcome it. Then fresh blood streams through the poisoned muscle and restores its energies by removing the chemical fatigue substances. But it is quite different with that other kind of fatigue in which the organ is really exhausted and a new upbuilding is needed to bring it back to its fullest efficiency. Long pauses are then essential. But it is also to be considered that the effect of pauses is not only the removal of the fatigue.

Every continuous activity of a repeating nature secures a certain adjustment of mind and brain by which the actions can be performed with less effort. The

worker becomes adapted to the task and experiment shows that this adaptation is lost or at least decreased by a pause. Hence the same interruption may have a double effect. On the one side it secures a restoration of lost energies and eliminates the disturbing fatigue, but on the other side it injures the perfect adjustment which had been reached. A very careful balance between the advantages and the disadvantages of the recess is therefore needed. On the whole it appears that with very frequent short pauses the disadvantages outweigh the advantages, and that the best effect is reached by longer but rare periods of recess.

The Use of Rest Periods

But the mere interruption of work is not the only essential condition for restoring energy. Much more depends upon the filling of the interval. To a certain degree the activity of other brain centers may be a help for the restoration of the fatigued ones. Experiments have demonstrated that the ability to lift weights is improved if it is interrupted by two hours of adding figures, while it is strongly reduced by a two hours' brisk walk. The hygiene of rest and the arrangement of proper surroundings and favorable conditions for the intervals in the day's work must be a most serious concern of the employer who aims toward the highest efficiency of the working force. No doubt the only way completely to restore the used-up nerve centers is sleep. During the work the complex chemical molecules are broken up and their destruction releases the energies which contract the muscles. During sleep the simple chemical substances which the blood carries to the brain are built up again in the complex molecules of the nerve cells needed for the day's mental and physical work.

Individual Reaction to Fatigue

Men differ greatly as to their subjective fatigue reaction. A question blank which was filled out by five thousand workingmen gave the following statistics. Among the miners 51 reported that they felt fatigue after the first hour, 58 after the second, 12 after the third, 203 after the fourth, 416 after the fifth, 412 after the sixth, 281 after the seventh, 297 after the eighth, 47 after the ninth, and 11 after the tenth. Two hundred and sixteen declared that they always feel tired during the work and 81 that they do not know fatigue at all. Among the textile workers fatigue seemed to be less pronounced. The greatest number of cases of fatigue was reported by them not before the eighth working hour, and a much larger percentage than among the miners declared that they never feel any special fatigue. The metal workers too complain only in relatively few cases of fatigue before the sixth or seventh hour, and the majority report to be free from fatigue.

The changes of efficiency during a working period are, however, not dependent only upon the increasing fatigue. We mentioned one other factor before, namely, the increasing adaptation to the work which consists of a better setting in the whole mind body-system. This improvement shows itself naturally in the beginning of each working period most strongly. It is the time of warming up for the work. If in an experimental way a detailed record is taken of the rapidity with which a fair average workingman is performing his task, it can indeed be found that the first part of the period shows a slow increase of efficiency and that the best work is secured after the first half hour or hour. When a few hours of sharpest work have passed by, fatigue begins to interfere and to reduce quantity and quality.

Yet secondary features make the situation still more complicated. Experiment shows, for instance, that toward the end of the period a new increase of efficiency sets in. The feeling of the approach of the resting period works as a new mental stimulation which for a while overcomes the inhibition of fatigue. Besides these factors large periodic waves in the efficiency of the individual worker can be observed. In the periods after a meal the mental energy is somewhat decreased. Independent of the distribution of meals, however, the various phases of the day re-enforce and depress the working power. It climbs and sinks with the sun. But great individual differences remain noticeable. Most men are freshest for work after the night's sleep, but not a few are not fully awake with the morning. Their nervous system is stirred up slowly by the excitations of the day and they are most fit for work in the latter part of the day's course. This difference, however, is much more significant for those whose vocation demands more intellectual than physical energy. Finally, the year itself brings its changes. Winter time is a period of reduced efficiency.

Blood Circulation in Fatigue

Only through most modern investigations have the scientists gained somewhat more insight into the automatic mechanisms which regulate the efficiency of the organs in the body and which are to a high degree independent of our mere good-will. Experiment seems to indicate that special brain centers regulate automatically the flow of blood to the muscles in the interest of efficient work. If the right foot, for instance, is lifting a weight rhythmically, the blood does not stream only to the muscles of the foot which needs the greater blood supply

directly for the strong exertion, but it also flows to the arms. If during the experiment the arm is held in a closed receptacle filled with lukewarm water, a so-called plethysmograph, the water rises in a finely graded tube when the arm swells with an increase of blood supply and the water sinks when the arm shrinks from a withdrawal of the blood. This regulation of the flow of blood is controlled by the nerves which dilate or contract the blood vessels. If the blood flows to the arm, it means that the blood vessels in the arm become wider, while those in the trunk, especially in the digestive organs, become contracted. The blood is taken away from the abdomen and thrown into the arms and legs which need it for the muscular work. This shifting of the blood to the places where it is most needed must be the work of a central nervous apparatus which evidently responds to the muscle activity in any part of the body by furnishing new blood to all the limbs.

As soon as the work becomes strongly fatiguing, this same nerve center produces the opposite effect. The exhaustion of the muscle stimulates the center to a reversal in the distribution of blood. In this experiment as soon as the lifting of the foot reaches a point where the muscles seem at the end of their energies the blood is withdrawn from all the limbs, the exhausted foot and at the same time the arm in the receptacle become deprived of the full stream, and the blood goes to the trunk. Even a continuation of the mental nerve-impulse to go on with the work would thus find an unfit apparatus. The muscles in which the blood vessels are contracted could not keep up the work.

But the experiment suggests at the same time a way to help the worker through this same mechanism. As soon as the foot is overfatigued by the raising of the weight

and the blood is withdrawn from it, the contraction of some other muscles, for instance, of the hands, must work as a new stimulus on that automatic center in the brain and must produce a new reversal in the blood supply. It can be seen that in this case a strong muscle contraction in the hands does indeed draw the blood again to the limbs and therefore also to the exhausted foot. In other words, if one part of the body is highly fatigued by work, the chief effect, namely, the lack of blood supply for the continuation of labor, can be overcome by some forcible muscle contractions in another unfatigued part of the body.

Mental and Emotional Influences

We have not yet spoken of the strictly mental influences, especially the emotional ones, which after all must determine the amount of work more than any physical mechanisms. The artisan who does not like his work and has no motives for standing at his lathe and who prefers to spend his time in playing cards, reduces his output by his laziness more than any fatigue could reduce it. And his neighbor who is stirred by ambition, and by the love of his work, and by the craving for money, will produce more by these mental sources of energy than by a mere hygiene of rest. To be sure, in contrasting such mental motives with the physical mechanisms we do not mean that they are less accompanied by physical brain-processes.

Laziness and industry, joyfulness and weariness at work, are the mental aspects of nervous processes, and we certainly cannot understand their effect on our behavior and activity if we do not give fullest attention to the physical aspect of these processes. It may even be said that the progress of physiology in our day has

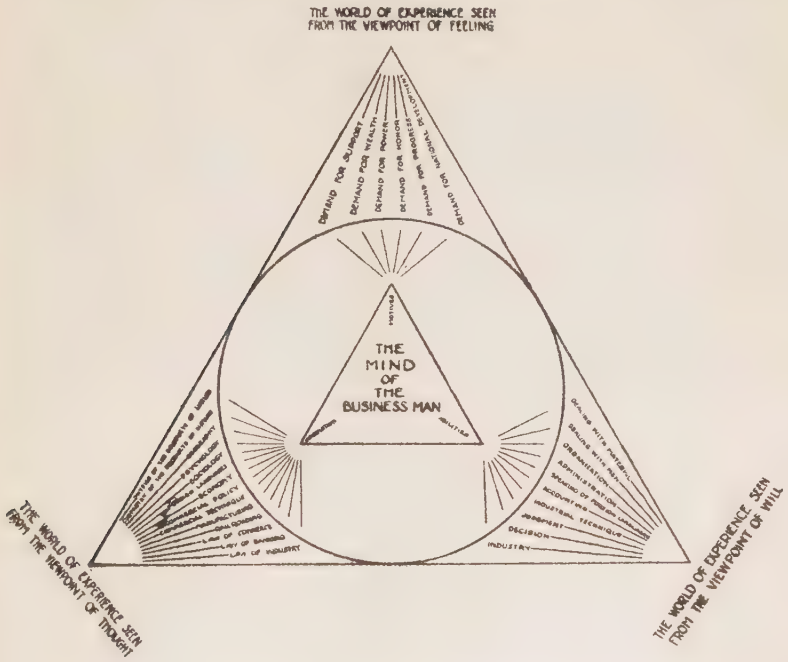
brought us nearer to an understanding of these emotional experiences than any merely mental study of them has ever allowed before.

Physiological Factors in Emotions

We understand the principle if we hear about an experiment like this. A quiet, playful cat is in a cage. Now a dog is brought near and barks at her. At once her whole expression and behavior change. Her back becomes curved, her fur bristles, the whole body is in the highest tension, ready for attack. What has happened? The physiological chemist has found an entirely new reply to the question. There is in the cat's body a little gland above the kidney and that gland produces a chemical substance, adrenalin, which it empties into the blood circulation. If a small quantity of blood is taken from the cat before the dog appears, no trace of adrenalin can be found in it, but a few seconds after the dog begins his barking, the gland has done its work, adrenalin has been injected into the blood, and the chemist can show its presence. It is this adrenalin which produces all the other effects of the cat's excitement, which makes the hair stand up and the whole body enter into attacking movements. These adrenalin glands play a similar role in the human organism and they are not the only glands in the body which empty their chemical products into the blood.

To be sure, the chemical products of most of the glands either leave the body, as in the case of the sweat glands or the tear glands, or are poured into the food channel, like the saliva in the mouth or the pepsin of the stomach or the bile of the liver. But other glands, like the thyroid glands at the larynx or the pituitary glands at the base of the brain, send their chemical products into the blood,

and there they circulate and affect and finally poison the brain and the spinal cord just as much as any substance introduced from without, like alcohol or cocaine. It seems that the activity of these inner glands plays an important role in our emotions and is responsible for much of the increased or decreased stimulation of the motor


THE WORLD OF EXPERIENCE SEEN FROM THE VIEWPOINT OF FEELING
THE MIND OF THE BUSINESS MAN
THE WORLD OF EXPERIENCE SEEN FROM THE VIEWPOINT OF THOUGHT
THE WORLD OF EXPERIENCE SEEN FROM THE VIEWPOINT OF WILL

The Mind of the Business Man as seen from the viewpoint of Thinking, Feeling, and Willing.

centers. Enthusiasm could not strengthen our power and worry could not decrease our power so much if the whole system of glands in our body did not co-operate in the process. The mental depression stops the normal activity of our stomach glands, and this ruins our appe-

tite and our digestion. This lowers the whole vitality of the organism and the efficient ability of the brain.

All the popular writings about the great value of cheerfulness in business life, of optimism, and enthusiasm, and jolly good fellowship, and the still more frequent preaching against worry and faint-heartedness, have their core of truth, first of all, in this physiological connection. The more we understand the individual mind and brain as an automatically working system, the better we recognize that efficient work must be dependent upon the emotional setting. On the other hand we know that emotions are contagious. An atmosphere of confidence and pleasant cheerfulness in a whole working force is not seldom the result of a joyful temperament of one or of a few men in the center. Still more often ill-temper and irritability at one responsible point may bring a large establishment into a mood in which the best energy for efficient work is sapped beforehand.

Practical Bearing

Everything which satisfies or dissatisfies the emotional demands must accordingly play an important role in the actual efficiency independent from the conscious will of the individual worker. He may be ever so faithful and industrious and ready to work. Nevertheless he cannot give his best if he is depressed by the hopelessness of his position, by the uncertainty of his engagement, by the insufficiency of his salary or his wages, by the disappointment in his career, by the disgust at the way he is treated, by the dislike of the work itself. Any wise administration will be directed toward the supplying of encouraging motives. A short working day with ample provision for leisure has everywhere proved profitable. The workingman can do in nine hours as much as in ten,

not only because he is less fatigued, but also because the quality and quantity of his work are improved by the happier mood with which he enjoys the life which brings ampler chance for recreation. The hope for extra earnings, the bonus and premium systems, the fear of fines, and all the similar appeals whip up the mental bodily energies directly, but their total effect must never be evaluated without reference to the general emotional influence.

The social psychologist will not overlook that often the emotional influence of economic theories must be important for the outcome. The workingman who feels that the society to which he belongs and the whole community treat the laborer with cruel injustice and who accordingly fulfills his daily work in mill or mine or factory with grumbling and bitterness cannot possibly be such a useful member of the industrial organization as one who is satisfied with the relations between employer and employes, between capital and labor in general.

TEST QUESTIONS

1. How does alcohol affect a person's ability to perform recurring mechanical operations?
2. How does it affect the motor impulses?
3. What are the probable causes of fatigue in work?
4. When are long and when short rest periods necessary?
5. Is interruption of work essential to rest? Illustrate.
6. Why are there periodic curves in the efficiency of the worker?
7. Why does exercising the right arm also strengthen the left arm?
8. How do emotions affect the physical condition of a worker? How do they affect his efficiency?
9. Why is contentment a valuable asset in a working force?

10. What are some of the physical factors of the environment which contribute to the contentment of the worker?

11. What are some of the mental factors in the environment of the worker which contribute to contentment?

12. Would the system of wage payment used in an establishment affect the worker's state of contentment? How?

13. How do the physiological factors of a person affect his emotional condition? Illustrate.

14. Explain just how laziness is the mental aspect of nervous processes. What mental step is necessary to a genuine cure of laziness?

15. From the viewpoint of what three mental factors is the experience of the business man made up? See the chart on the mind of the business man.

PART FIVE — INDIVIDUAL DIFFERENCES

CHAPTER XV

VOCATIONAL FITNESS

Misfits in Life

We have analyzed the general conditions for efficiency in commercially valuable work. The idea is that they hold good for everyone. But everybody knows that under the same conditions different individuals achieve very different results. We have to give our attention now to the personal factor which gives commercial and industrial life an abundance of shades. Every mental feature which we have analyzed, knowledge and interest and will, can vary, and any variation of memory or attention or emotion or energy or thought must create conditions which are especially favorable or unfavorable for the special business undertaking. The great problem which was almost neglected until only recently is how far the mental conditions of the special individual are related to his special task. This must lead immediately to the further question as to how we can examine the personal mental traits and how the results of such tests can be made serviceable to the selection and distribution of commercial and industrial workers. This is in our day almost the center of business psychology.

The importance of the problem cannot be overestimated. Of course it is in no way confined to the business world. In its widest setting it refers to the whole social

sphere of vocational activity. Everywhere we meet the difficulty of finding the right man for the right place. It is significant for the professional and academic vocations as well as for the commercial and industrial ones. But inasmuch as every vocation has its bread-earning side, the professional work too can be subordinated to the point of view of a business undertaking.

The gravity of the question is evident to everyone who looks with open eyes into the turmoil of mankind. However sad it may be, it cannot be denied that a majority of men and women who have to fight in the struggle for existence themselves have the feeling that they do not stand in the right place. They feel disappointment, perhaps they consider themselves as failures, and yet they are instinctively convinced that in some other place and under some other conditions they could have done better and would have succeeded to a higher degree. They know that it is too late, or they do not even know in what direction to change. Too often life throws them cruelly on the street without any guarantee that they can find by their own efforts the place where they will do better.

At the same time we hear from the employers everywhere the complaint that really efficient employes are lacking. Certainly in every bread-earning occupation there is plenty of room at the top. The most pitiful situation shows itself in the industrial establishments. In many large factories the average length of service is alarmingly short. "In an institution manufacturing agricultural implements and employing on the average 2,400, 7,200 are employed every year. In a well-known steel mill 26,000 men pass annually through the institution in order to maintain an average working force of 8,000." In not a few big establishments the changes in

the personnel are still more rapid and certainly a complete turn over every year is not unusual.

How could it be otherwise? Every year millions of boys and girls leave the schoolroom to find some occupation. Numberless motives lead them hither and thither, but how exceptional are the cases in which any attention at all is given to the most important condition of efficient life-work, the mental fitness of the worker for his task! The most superficial impulses determine the turns of the road. Chance information and chance advice, haphazard impressions of good opportunities, above all the accident of a vacant place, the wish to be with friends, the convenient location, family traditions, and a hundred other secondary features are decisive, while the primary factors are neglected. Wherever a strong talent exists, it, of course, finds its right setting, but the average is satisfied to be pushed passively into some chance group or actively to seek something with which he has no internal contact and in which he seeks, after all, merely an easy way to earn a living, unconcerned about the abilities, dispositions, and acquirements of his mind and brain.

The result of such helter-skelter distribution is then necessarily disappointing. The nation is justly enthusiastic over the new movements to conserve the natural resources of the country which have been wasted recklessly. We know that it is an inexcusable economic policy to despoil the forests and the mines and the soil by thinking only of the needs of the day and neglecting the needs of the coming generations. But surely the habitual waste of natural resources is small compared with the tremendous waste of human energies in the markets of the land. Men and women who are willing to give their best are carelessly thrown into work at which their mental abilities force them to an unsatisfactory output. With

better care their efforts could be so directed that they would become a source of wealth instead of being a burden to themselves and to the community.

Vocational Bureaus

Only in most recent years can systematic endeavors to relieve the strain of this social situation be traced. A most promising beginning has been made in the form of the vocational bureaus, of which the first was started in Boston a few years ago. It grew out of a neighborly effort to help the boys who leave the elementary school to find work which they would like. In a spirit of social friendliness without any scientific ambitions the counselor recognized how important it must be to bring the true interests of the boys to light and to advise them as to the vocational roles in which they would find the best chance to satisfy their personal inclinations. In following out this plan he began to analyze the talents and dispositions of the boys and to supplement their school records by observations of their natural tendencies. In this way he became able to help many an ambitious and intelligent young fellow to turn to lines of work of which he himself would never have thought on account of lack of knowledge concerning the social opportunities. This charitable social aid grew into an organized effort, and a little bureau was established. Very correctly many factors were considered there at the same time. The analysis of the mental traits and tendencies had to be only one of these factors. Others were quite properly the demand and supply in the various callings, the wages, the requirements as to bodily strength in various places, the chances for health and hygiene, the opportunities for later promotion, the social aspects of various vocations, and so on.

But the more this movement expanded and the more it became a routine establishment which was imitated in other municipalities, the more the purely psychological analysis of the mental qualities of the individual applicants was pushed into the background. On the one side the nearest duty of the bureaus became the finding of places for the boys and girls, that is, they developed in the direction of employment bureaus, and on the other, more important side, they undertook thorough researches into the actual conditions of the various vocations and the chances they offer as to wages, promotion, health, and so on, with special reference to various localities. Moreover they put much effort into the development of vocational counselors who could spread interest in the vocational problems throughout the country. But under the pressure of these various interests the psychological examination was slowly crowded out. The vocational counselors felt that to examine the mind without exact scientific methods would be rather amateurish and might easily mislead more than help. On the other hand they felt that true scientific methods for vocational guidance on the basis of mental qualities were not as yet sufficiently developed and that the next move must come at first from the scientific psychologists themselves.

Psychology in Vocational Guidance

This describes the situation pretty exactly, as indeed nothing can be gained when psychological laymen begin haphazard experiments on the memory or attention or will or intelligence of a boy or girl without any thorough training in the proper methods which have been developed in the psychological laboratory. And the counselors are not in the wrong if they add that the psychologists themselves are not prepared to furnish standard methods

for the examination of the mental traits which are needed for the particular business positions. Everything is at its beginning, and the psychologists have no right to push their tentative methods too early into the vocational bureaus. They are fully aware that the answer to the question, "What vocation ought a boy to choose?" is far more difficult than the answer to the other question, "Which boys are fit for a particular vocation?" The psychologist feels therefore that this latter question ought to be studied first. He can examine which boys are mentally fit for the requirements of a position of chauffeur or shorthand writer or aviator or traveling salesman. This is much easier than to ask in general in which vocation a particular boy will succeed best.

Psychology Required in Scientific Management

But this more accessible problem has also been approached very seriously by a popular movement which, like that of the vocational bureaus, began rather far from laboratory psychology. This other movement is that of scientific management. It is well known how this important and successful movement started with the study of shop administration and led to a thorough analysis of the functions involved in industrial life. The endeavors of the scientific management engineers suggested many improvements which referred to all individuals alike. The new distribution of work, the careful simplification of necessary motions, the perfect adjustment of the various workers to one another, the introduction of well-graded incentives for high-class work, the scientific improvement of tools, and many other elements of scientific management are valuable for every individual. But it is necessary that the insistent carrying-through of the principles lead also quickly to a consideration of

individual differences. If a piece of work is to be performed truly in the best possible way, it may be taken for granted that a selection of the proper workingmen is an essential condition.

Physical traits were considered first. Some mental functions, like acuity of vision or delicacy of touch, then had to be considered, and finally in certain cases the rapidity of will-action. But even these time measurements of mental impulses were dealt with in a general way. A subtle examination of the significant mental functions concerned was never in the programme of scientific management. It was felt that much help might be gained from that side, but again the mastering of that task was left to the psychologists. On the whole it must be acknowledged that wherever the engineers of the scientific management movement approached the mental problems, they took them up in a popular way without any reference to the progress of the exact psychology which has interested us throughout our discussions.

The professional psychologists have finally recognized the importance of the questions which the vocational bureau movement and the scientific management movement have left unanswered. They saw from their point of view that after all the fundamental problems of both movements can be solved only by a systematic advance in the application of strictly psychological methods. The peculiar characteristics of individual minds are responsible for the fitness or unfitness of a boy or girl for special work and only through careful observation of these various mental traits can it become possible to say beforehand which bread-earning occupation is the most advantageous one for a special individual and which of a number of applicants will be most satisfactory for a special position.

TEST QUESTIONS

1. What is the situation in the industrial world with reference to the adaptability of individual workers to their work?

2. Are you a misfit in your own position? If so, how can you remedy the situation?

3. What assistance can vocational bureaus give the individual in choosing his life-work?

4. How can psychology aid the movement for scientific management?

CHAPTER XVI

INDIVIDUAL MENTAL TRAITS

Importance of Correct Classification

The observation that men are different is of course not only familiar to everyone in practical affairs but is emphasized by every foreman and every employer, by every storekeeper and every traveling salesman. They know that the political conviction that men are born equal does not contradict the fact that no two men behave exactly alike and that their mental physiognomies show as many differences as their faces. The skillful salesman in the store is proud of his ability to deal successfully with every type of customer and to recognize with a sure eye what kind of approach is needed for the particular individual.

Popular business psychology is mostly confined to a superficial classification of large groups of men on the basis of general impressions. The traits considered in such unscientific systems are not really ultimate and elementary factors of the mind, but complex products which may result from very different mental conditions. It is as unscientific as if we were to classify the animals as animals in the water, and on the earth, and in the air, and again the animals in the water as those which are large or small. It is evident that through such a superficial classification the class of water animals, for instance, would comprise creatures which are zoologically as unlike as the whale, the salmon, the lobster, the starfish, and the jellyfish. The zoologist goes back to the

real structural differences and bases his classifications on them; the psychologist cannot do otherwise.

Use of Popular Classifications

Discriminations and classifications as they suggest themselves from the point of view of practical life may nevertheless often refer to real psychological traits, and no psychologist will underestimate the value of such observations. He will only insist that they offer nothing but crude material from which in the best case suggestions for true psychological differentiation may be gained.

A practical traveling salesman, Mr. Charles Lindgren, who claims to have sold to the largest merchants in the world and to the smallest country dealers as well, and whose experiences have led him from the Atlantic to the Pacific, surely shows himself a close observer and student of mood and motives when he groups the buyers who can be met into the following long list of types. There is the buyer who loves to argue; the disputative buyer; the opinionated buyer; the inflexible buyer; the impolite buyer; the irritable buyer; the buyer of choleric temper; the aggressive buyer; the "know it all" buyer; the disagreeable buyer; the antipathetic buyer; the buyer who is an egoist; the buyer who brags; the conservative buyer; the curious buyer; the conceited buyer; the buyer that cannot say "no"; the communicative buyer; the credulous buyer; the cunning buyer; the cold-mannered buyer; the buyer who is concentrative; the buyer who likes to compare; the buyer who is changeable; the cheerful buyer; the deceitful buyer; the buyer who intends to defraud; the buyer who doubts; the dignified buyer; the buyer who drinks; the envious buyer; the buyer who is always busy; the extravagant buyer; the buyer who is easily influenced;

the buyer who is easily rattled; the flighty buyer; the fastidious buyer; the forgetful buyer; the buyer who buys for friendship's sake; the buyer who is an old fogy; the buyer of large feminity; the strongly masculine buyer; the buyer who is a grafter; the buyer who likes good times; the buyer who is gullible; the buyer who is a hypocrite; the honest buyer; the buyer who is a good judge of human nature; the impulsive buyer; the buyer who is an imitator; the incredulous buyer; the buyer who lies; the mirthful buyer; the malicious buyer; the methodical buyer; the optimistic buyer; the pessimistic buyer; the suave buyer; the open-minded buyer; the taciturn buyer; the suspicious buyer; the buyer who is a plunger; the over-cautious buyer; the buyer who is an observer; and the buyer who is a thinker.

It is clear that such a grouping anyhow does not really characterize the various personalities, but merely emphasizes particular aspects; any buyer may be in quite a number of these so-called classes. Moreover the analysis is accidental, and the list might therefore be prolonged without limit. Of course, just in the case of the buyers and customers the scientific psychologist would hardly feel an interest to try to do better. He knows that a thorough analysis from a psychological point of view would give very different results. He would secure really characteristic groups which would suggest in every case the type of selling which would have the best chance for success. But he would know that his ideal method would be entirely impracticable, as the relation of buying and selling would never admit any exact experimental scrutiny. The customer who enters a store to select a fur coat cannot first be invited to sit down for psychological experiments in order that his degree of suggestibility or his rhythm of attention be exactly determined before the

salesman begins to exhibit the new importations and to marshal his arguments. Yet even to the salesman some truly psychological grouping may be helpful as soon as easily recognizable traits of the various groups can be found.

We shall speak later of this possibility of recognizing, without direct experiments, mental traits from some outside signal and from some superficial symptom, but surely the scientific psychologists have little to offer along this line as yet, and can hardly complain that this whole field of salesmanship as far as the individual differences are in question is still essentially under the control of popular psychology. The scientific method is so far much more adjusted to the task of standardizing the methods of selling and of developing the right reactions fitting for every possible sale than of adapting the transaction to the individual traits.

Classifications into Contrasting Tendencies

A popular classification without special reference to exact mental measurements and even without reference to elementary mental traits has better chances to yield valuable results where differences of abilities and inclinations are observed. A certain rough distribution of young men into the chief groups of business vocations can indeed be well carried out when not the subtle mental details but the main streams of mental inclinations are noted by a trained observer. The best method for such popular psychological work is the division into contrasting tendencies so that a positive and a negative group are always confronting one another.

As an illustration of this helpful method, we may point to the endeavor of the Dean of the College of Engineering in the University of Cincinnati, Mr. Hermann

Schneider. On the basis of seven years of experience with about five hundred students who worked half in the academic department and half in practical work in manufacturing, construction, and transportation, he found that the following pairs of qualities ought to be considered if a technical position is sought for a man.

It ought to be decided first whether he is of a mental or of a manual type. Many people whose intellectual efficiency is strong are utter failures at all kinds of work requiring manual dexterity. They would be unfit to become machinists or molders or masons, while they might be excellent as designers or executives or leaders. Many, to be sure, are efficient in both directions.

His next pair of qualities is what he calls the settled and the roving type. The man of the settled type likes the routine life, while the other would suffer under a regular repetition of the day's functions. He wants to move about, know people, see and do new things. The uniform work in a shop in which a standard product is manufactured would fit the one excellently, while it would appear intolerable monotony to the other.

A third distinction which is far too often neglected is that between the indoor and the outdoor man. We must accept that as a true difference even though many persons are rather neutral. Sociological conditions force probably far too many men from the country into the city and turn men who would be successful outdoors into workers who are unsuccessful and unhappy because they are obliged to spend their days indoors. To ignore such personal differences and to claim that good-will can overcome them is very shortsighted. Of course an energetic man, however strong his desire for outdoor life, may have the energy to sit faithfully nine hours a day at a desk in a narrow back office, but his psychophysical energies will

be impaired and his efficiency wasted in spite of his best will. He is a misfit and no amount of will-power can make him anything else.

Again we have an important contrast in his two classes of directive and dependent personalities. The directive individuals naturally assume responsibility, while the others just as naturally evade it. But it would be entirely misleading to consider the lack of directive inclination as a trait of an inferior mind. Just as the indoor and the outdoor men are both equally good and important for different tasks, the man who prefers to direct others and the man who is doing his best when he is relieved from the duty of directing, both have their important places in the business world. The so-called dependent mind may produce much which the directive mind could not accomplish.

Another group of opposites refers to the expansion of the scope to which the individuals are best adapted. Some like to give their attention to an intricate bit of mechanism, while others feel happy only with tasks of large dimensions. The first may be excellent as a watch-maker or as an engraver, while he would be unfit as a bridge-builder or steel-mill worker.

The following group separates the adaptable and the self-centered personalities. There are indeed men who very easily accept the color of their surroundings and are almost new men in new business places, while others stick to their strictly personal role and carry it into every new sphere of action.

Still more attention ought to be given to the difference between deliberate and impulsive men, the one carefully thinking out the situation before he acts, the other quick at work, relying on his instinct and even hardly profiting from quiet reasoning.

An interesting pair is suggested in the classification of dynamic and static persons. The dynamic is a man with determination and grit who makes the world move. He is the perpetual cause of changes; he looks steadily for improvements; he is never satisfied; he is radical. The static mind is conservative and takes care that the good elements which tradition has secured remain intact and are not hastily overthrown. He is satisfied with the actual conditions because he is inclined to see the good in them. Again it would be hasty to claim that the one is the desirable, the other the undesirable element of the practical community. Both have their important functions, and the two may co-operate in the smallest workshop as well as in the great business world at large.

SUMMARY OF SCHNEIDER'S CONTRASTING TENDENCIES

Mental Type	Manual Type
Settled Type	Roving Type
Indoor Man	Outdoor Man
Directive Personality	Dependent Personality
Large Dimension Worker	Small Dimension Worker
Adaptable Personality	Self-Centered Personality
Deliberate Man	Impulsive Man
Dynamic Type	Static Type

Psychological Methods of Determining Individual Traits

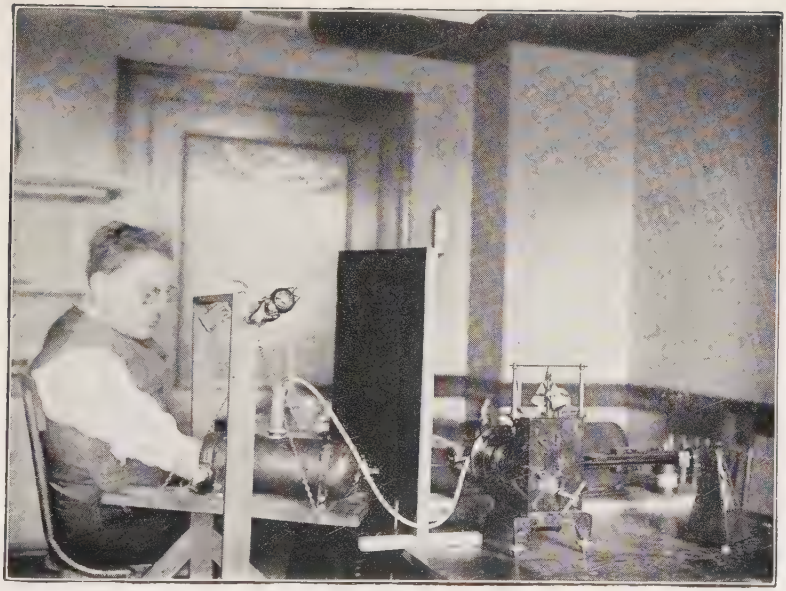
The psychologist goes an entirely different way. He naturally bases all observations of individualities on the system of mental processes. He groups the mental functions, both the elementary and the complex, and in each case seeks the directions and limits of possible variations from the average to the extreme. The extreme variations may lie in either direction, the greatest efficiency or the greatest deficiency. If the mental function which he

studies is musical ability, the genius who composes great symphonies is as much an extreme variation as the entirely unmusical man who cannot discriminate any tone intervals.

We subdivided the mental processes into those of knowledge, of interest, and of activity. The traditional way is to call it thinking, feeling, and doing. In our acts of thinking, including the perceptions and memories, we try to understand the world; in our acts of feeling, including our interest, our attention, our emotion, we take an inner attitude toward the world; and in our acts of doing we try to change the world. The psychologist, far from a simple classification, asks therefore concerning the first class: What are the possible variations of perception, memory, and thought? As to the second class, What are the variations of attention, feeling, and emotion? And as to the third, What are the variations of impulse, will, and behavior?

Practical Hindrances to Complete Measurement

In practical life we can never even approach an ideal completeness in the measurement of all such functions. It would take many months to make an exact record of the mental characteristics of one individual with the subtle methods of the laboratory. No two persons among the fifteen hundred millions on the globe are mentally alike. Much of this variety depends, to be sure, not upon original differences but upon experiences. Every one of us has seen and heard and read different things from his neighbor. From the first day of life different experiences have streamed through all sense channels into his consciousness. He therefore possesses different supplies of memories and different material for his thought and imagination. Moreover everyone went through a different



On the table in the right side of the picture stands a rather complex kymograph. The cylinder of this apparatus moves on a horizontal axis so that the right-left movements of the levers are recorded. The part of the kymograph which forms the foreground consists of a system of wheels by which the rapidity of the revolution of the cylinder can be altered from one second to eight hours.

The process which is registered in this experiment is the change of blood pressure in the limbs under the influence of mental acts, as well as the effects of fatigue. The right arm of the experimenter is in a plethysmograph, a tube filled with water. As soon as the blood streams into the arm, the water presses the air in the small cylinder at the top and this air pressure is transmitted by the rubber tube to the levers of the kymograph.

order of training; everyone experienced some connections more often or more seldom than his neighbor, was more often or more seldom in a situation which demanded a particular reaction, and therefore his abilities are more or less developed than those of the other man.

Even if life had made men after a machine pattern all completely alike at the day of birth they would be utterly unlike after being tossed about for twenty years in the world of reality. Even if men were born psychologically equal, they would be psychologically entirely unequal after their receiving the different influences from parents and nurses and teachers, from books and newspapers, from travel and church, from friends and foes. Every success and every disappointment, every act of friendship and of love, every conversation and every meeting, has left some traces in the mind and has contributed to the incomparable manifoldness.

Inherited Dispositions

Yet when the psychologist speaks of the importance of individual differences of men for practical life, he thinks much less of these acquired variations than of the inherited dispositions. The individual traits of attention or memory or thought or will which nature gave to a man from his birth are more fundamental than the material which he has gathered during his development. They are the gifts which he has received from his ancestors, and they decide more than anything else success and failure. Only in a limited way can they be molded by training. In practical life we classify these inherited dispositions mostly with reference to three traits, namely, intelligence, temperament, and character. As an appendix we ask also for special talents. But the emphasis on these four aspects is not more justified than an external classi-

fication of men's appearance with regard to the color of their hair or the color of their eyes or their height or their strength. If we know about a person that he is short and slender and has blond hair and blue eyes, we know some features which enable us to pigeonhole the picture, and yet it is evident that this is endlessly far from a real anatomical description. Thousands of measurements and statements would be necessary to satisfy the anatomist with a complete description of the individual body. Not fewer are needed for the description of the individual mind.

Yet it is not by chance that we are accustomed to lay so much emphasis on intelligence, temperament, and character. Intelligence refers to the type of our thinking, temperament to the type of our feeling, and character to the type of our doing. In every one of these three realms, however, only a very limited view is taken as long as we confine ourselves to the intelligence, the temperament, and the character.

INTELLIGENCE

Especially what we call intelligence by no means covers the processes which the mind needs for a knowledge of the world. To know the world means first of all to perceive it and to remember it. Yet a man with very poor perception and unreliable memory can be very intelligent, and another with excellent perception and splendid memory can easily be very unintelligent. His memory may sometimes cover up the defects of his intelligence, just as strong intelligence may make the deficiency of memory unnoticeable, but memory and intelligence remain two different functions. *Intelligence is the ability to use one's mental resources in the understanding of a situation.* A man with very limited education and accordingly

with very poor resources may yet make very excellent use of them, and another who has learned plenty of detail may be very unskillful in employing it for the interpretation of the situations he faces. But surely this ability to think intelligently is of such fundamental importance for practical life that it is not surprising if it is picked out in daily routine as the most essential representative of the various functions which enter into our knowing process.

TEMPERAMENT

In the sphere of our subjective attitudes again we confine ourselves mostly to the narrow circle which is covered by the term "temperament." It singles out the inborn tendency to respond with emotions. We usually discriminate four types of temperament with reference to the rhythm and to the strength of the emotions. The four classes consist of those who have slow but strong emotions, then slow but superficial emotions, then quick but strong emotions, and finally quick and superficial emotions. The sanguine and the phlegmatic temperament, for instance, agree in the superficiality of their emotions; only the phlegmatic person goes slowly into the new emotional attitude, the sanguine quickly. The superficiality of their emotions in both cases favors a certain optimistic mood.

But this merely formal aspect of the readiness to develop emotions in no way characterizes the possible manifoldness of emotional behavior, and it neglects entirely all the other aspects of subjective reaction. We noted especially the function of attention, in which the personal interest expresses itself. Certainly the individual differences of attention are in no way less characteristic than those of the emotions. The extreme importance of the

different types of attention is far too much underestimated in routine life. They are neglected because they cannot be so easily discovered from surface impressions as the differences of emotions. But their influences on practical life-work and their importance for success and failure are certainly not less strong; and the exact measurement can easily determine them.

CHARACTER

Finally it cannot be overlooked that we do not do justice to the various functions of personal activity if we characterize them simply under the formula of strong or weak character. The character differences refer to the energy with which the mind sticks to its motives. A strong character is one in which the idea of a goal, the idea of the end of an action, has such strong determining tendency that every idea which would lead to opposite behavior is inhibited and suppressed and remains ineffective. The strong character overcomes a temptation and remains loyal to the ideal. The weak character is one in which any intruding idea may become stronger than the plan of action.

All this does not, however, tell us anything concerning the individual differences of the automatic responses, of the instinctive impulses, of the quickness and slowness of reaction, of the ability to combine actions in new units, of the tendency to fatigue in action, of the ability to learn through training, and many similar features from the sphere of man's behavior. A truly psychological analysis will give attention to all these mental processes alike and if the psychologist makes of a personality what we nowadays call a "psychogram," he gathers as full data as possible concerning the individual's abilities and

trends for every one of those various functions in the sphere of knowing, feeling, and doing.

Inclusiveness of Individual Psychological Examinations

The boy or girl who wants to turn into business life will hardly require an examination of all possible functions of the mind. If anyone wants to enter banking or salesmanship, factory work or mining, it is not necessary that his tone perceptions, his ability to distinguish musical intervals, his memory for melodies, and his voice be examined, as would be necessary for the future opera singer. But whatever the special commercial or industrial vocation may be, we must not believe that mere knowledge, or mere interests, or mere activities are sufficient. Every vocation demands mental functions of all three classes. No one can fill a place in life who is not efficient in his knowing, feeling, and doing. It is the cooperation of these three groups of mental functions which characterizes every possible occupation and vocation in life. This is far too easily overlooked and the circle of mental functions which must be considered is accordingly often underrated.

The Three Basic Factors in Any Calling

A certain knowledge of facts is indeed the necessary prerequisite for every vocational achievement. It makes no difference whether we watch the engineer who builds a bridge or the cook who prepares an omelet, the farmer who plants his squashes in the field or the traveling salesman who sells shoes to his customers. Each of them needs for successful work a certain acquaintance with a group of facts, that is, some theoretical learning. It is indeed theoretical knowledge to know how an omelet is

to be mixed, and when is the fitting time to plant the field, and what varieties of shoes are in the market, and what the properties of a steel bridge are.

Yet it is evident that there is no calling, not even the most scholarly, which is dependent upon knowledge alone. Though you know the cookbook by heart, you may be a poor cook. You must have learned to do things. Others may have showed them to you; then you have learned by imitation. Or you tried by yourself and slowly learned by experience. But in any case you must have mastered the technique and must have learned to turn the omelet in the pan.

The engineer's art of the bridge-builder again certainly includes far more than scientific knowledge, even if we expand the knowledge to cover the whole ground of applied science. This knowledge of practical engineering as mere knowledge is distinctly different from the real training. The bridge-builder must have learned how to use his knowledge for his practical task, and the farmer must know how to scatter and to cover his seed. The traveling salesman has as his material for practical activity not things but men. He must persuade them; he must argue with them; he must offer his wares to them in the most attractive manner and suggest to their minds the resolution to buy. Again this is an ability, a practical achievement, which lies in an entirely different direction from the mere knowledge. And many a man who knows much may yet be unsuccessful in the mastery of his practical performance.

Every occupation, humble or proud, thus demands the knowledge of certain facts and the ability to perform certain actions. Yet the most important factor is still left out, the energy which puts the whole machine in motion. We may know all the facts which are of importance for

the case; we may be splendidly trained to master the situation; and yet we may have no reason to step in and no interest in taking any part. The third element must enter. We must be aware of a demand which is to be satisfied. If there were no market for the farmer's squashes, he would have no interest in applying his knowledge and his skill. If the economic conditions of the country did not demand a bridge over the river, the engineer would not think of entering upon his bridge-building work, even though he had all the data in his mind and all the skill in his control.

We have, accordingly, three fundamental spheres in every calling. There must be a need to be fulfilled. This fulfillment must refer to facts which must be known and understood. Hence we need (1) a feeling consciousness of demands, (2) an ability for performance, and (3) a knowledge of facts. Of course a thousand conditions must influence the mutual relation of these three mental functions. Moreover each of these fundamental features may in itself present great variety. For instance the feeling demand may be a selfish one and at the same time an ideal one. The bridge-builder may do his work because he is interested in the mechanical problem and also because he is interested in the economic condition of the country which demands the bridging of the river at that point; and yet he may be no less interested in his personal fame and finally in his personal fee. His feelings are thus very complex. But surely some feeling element and some knowing element and some doing element must be combined in every bread-earning occupation.

Psychological Tests in all Three Directions

To determine the fitness of an individual for successful activity in any commercial or industrial sphere of life involves therefore a careful observation of his mental

traits in all three large fields. Practically we may concentrate our interest on some special function in one of the three spheres because it may be especially significant for the vocation or especially difficult to attain, but this always means a certain neglect and one-sidedness which may be dangerous. We may invent skillful tests to examine the ability of a chauffeur to drive a car under most difficult circumstances, but while this may appear sufficient for our immediate purpose, we may have reason to regret not having examined, for instance, his emotional sphere, as, in spite of his technical skill, his emotional recklessness or his carelessness or his desire for drink may bring us into a greater danger than a lower degree of efficiency in driving. If we could make an ideal study of the mind of a candidate, whether an office boy or president of the company, an unskilled workingman or a chief engineer, we ought always to know the exact conditions of his thinking, feeling, and doing in all the manifestations of perception, memory, imagination, judgment, attention, feeling and emotion, impulse, instinct, and will.

TEST QUESTIONS

1. Are many of the popular classifications of mental types scientific? Why?

2. Into how many classes does Mr. Lindgren divide buyers?

3. What is meant by Mr. Lindgren's list's being based upon accidental characteristics?

4. What is meant by classifying people according to contrasting tendencies? What is Schneider's list?

5. What influence has experience upon our life?

6. What is meant by inherited dispositions of intelligence, temperament, character, and special talents?

7. Describe in an analytical way how a strong character is distinguished from a weak character.

8. What three factors are required for vocational fitness and for success in every calling?

CHAPTER XVII

SELECTION OF FIT INDIVIDUALS

Kinds of Examinations

If every vocation makes special demands on the dispositions, abilities, and possessions of the mind, the task must be to select the persons who bring the right mental equipment to the work to be done. What methods can help us in this psychological examination? Is it necessary to examine in every case the whole mental household of the applicant? Is it indispensable to study every single function of his mind before we say that a man ought to be appointed or not? A certain selection of the most important mental traits to be studied suggests itself anyhow.

If a physician has to examine all the details of an organism in order to discover some hidden trouble, he needs at least three hours' direct study of the case and several days are still required for the various chemical observations. He uses his Roentgen rays and electrocardiograms, the stomach pump and what-not. But if the physician wants only to find out whether a man ought to be accepted for life insurance, he omits nine-tenths of those subtler tests and is satisfied with a few chief data. And if a patient comes to the doctor with a complaint about a sprained foot, he will not even go through the examination of heart and lungs which are needed for the life insurance. Yet the good physician knows how much the physiological functions are connected. If a man com-

plains of headache, he will not be satisfied with prescribing some aspirin, but he will indeed examine his stomach and his kidneys and his nervous system and his blood pressure and so on to discover the deeper sources, because the functions of the body are thoroughly interrelated.

In the mental sphere the situation is similar. Here too it would be absurd to examine the whole mind with all the means of science if the purpose is a limited one and if the study of certain particular mental features is evidently sufficient. But again it needs very careful consideration of how far the mental abilities are related and how far deficiency in one may bring evil consequences in an apparently quite different field of action. But before we consider this fuller examination of the special mental features, we may ask whether certain short cuts are not at our disposal, methods by which we may gain all the needed information without taking the trouble of examining all the special facts in the case.

Group Psychology

Such a short cut is offered by that branch of psychology which may be called "group psychology." Its aim is to find those mental features which are characteristic of definite groups of men. Group psychology must not be confused with social psychology, another important branch of psychological interest. Social psychology embraces all those mental facts which are dependent upon the co-operation of several individuals. For instance, the mental processes involved in the use of language, or the acts of imitation or suggestion, of subordination and self-assertion, belong to social psychology. In group psychology, on the other hand, the question is not how a group of men work together and how they influence one

another, but what mental characteristics are common to them as a class wherever they may be found.

The members of such a group may not be in contact with one another at all. We may ask what are the mental traits of the fishermen. We treat the fishermen of the whole world then as one group, and it is evident that the members of this group are not at all a social community. They do not know one another and do not influence one another, but they all may have certain common characteristics resulting from their perilous occupation. Now if we develop such a group psychology, it can indeed help us to simplify some problems of vocational selection. If a person clearly belongs to a definite group and we know that the members of this group have certain definite mental traits, we can take it for granted that this individual shows these traits, and it becomes unnecessary to examine this particular person. We silently project all the characteristic qualities and traits of the whole group into the individual before us.

The limitations of such a short-cut method cannot be overlooked. We have no right whatever to claim that the traits of the group can all really be found in every single individual of the group. Group psychology is based on statistics. We can only find averages; that is, we may find that of a thousand fishermen a majority has certain mental traits very strongly developed and a large number of the minority has at least certain traces of those traits, and only a small number of all examined may show complete absence of those mental dispositions. We are then perfectly justified in saying that the group of fishermen as such can be characterized by the presence of those mental features. But if we meet one fisherman at the shore we have, of course, no proof at all that he may not be just one of the few who form the exception or

one of that relatively large group in which those traits are only faintly developed. It would be arbitrary to take it for granted that he belongs to the majority. If we want to make sure whether he is a member of the majority or not, we would after all have to examine him individually and that means we would have to give up the short cut of our group psychology.

It is easy to recognize that the group of miners and the group of weavers and the group of office clerks each has its particular acquired mental traits different from the traits of the others and from those of ministers or of army officers. But it would not be difficult to find one or another office clerk who shares the predominant features of the mill-worker and an individual weaver whose mental traits are much more those of the miner. In short any reliance on the results of group psychology can lead us only to a certain probability of correctness. We are never certain that our judgment of an individual and accordingly our selection of him for a particular place, is correct.

PRACTICAL APPLICATION OF GROUP PSYCHOLOGY

As far as appointments are concerned, one occasion on which group psychology is very important is when large numbers are to be selected and individual examination is out of the question. When several hundred men are to be employed for work which needs particularly certain mental traits and it is known from group psychology that just these traits prevail in an especial group, for instance, among the Italians or the Russians or the Irish, it seems safe to prefer men of that stock. Among those hundreds will be again quite a number who are exceptions to the rule and who differ widely from the average, who may even lack the desirable ability entirely. But if the state-

ment of group psychology was true, it may be expected that a much larger number of men with the desired trait will be among the hundreds of this group than of any other.

Surely much popular group psychology is nothing but prejudice based on chance experiences which are unduly generalized. Foremen in factories are readily inclined to claim that this or that kind of work demands men of this or that nationality because they are best fitted for it. If such claims are examined in cities with many racial elements, it can easily be discovered that these ideas differ from place to place and that for the same work in one factory it is declared that the Poles are best fitted, in another the Irish, and in a third the Swedes are preferred. A really scientific group psychology is only at its beginning.

AGE DIFFERENCES

The group differences which scientists have traced most carefully are those of age and sex. All children of a certain age form in this sense a group of their own. They have certain definite mental traits as compared with an adult. In the business world small children do not come in question, and we may even leave out of consideration the not exceptional case of child labor. But it would be misleading to expect the boy or girl of fourteen to possess all the mental traits of the adult. Many functions need still further development. Attention, memory, and apperception have not reached that degree of efficiency which they will reach six years later, not only through further training but by the natural growth of the mind brain-system. It is a development with marked rhythms and with changes of characteristic, definite periods, changes which even involve a decrease in the ac-

tivity of certain mental functions while most others increase. The predominant feature of this period is the rich development of high-pitched feelings and sentiments, often with quick changes and deep influences on the whole intellectual and active life.

On the other hand the group psychologist knows the characteristic decrease of mental abilities in old age. The associative mechanism weakens, the spontaneity of the mind decreases, the senses suffer, the memory for recent impressions becomes defective. The question of appointing elderly persons to positions which demand a full-fledged mental life cannot remain untouched by such average observations. Yet just in this respect the wide deviations from the average are very familiar. It is well known how eager the mind of many an octogenarian still is. In any case the group psychologist can hardly doubt that the present-day tendency to prefer the man of about thirty in the important positions of commerce and industry is hardly justified by a careful observation of mental functions. The advantages of development in the mind of forty-five to sixty are too much neglected compared with the more superficial merits of the mind of thirty to forty.

SEX DIFFERENCES

The economic life of the nation is still more influenced by group psychology with reference to the group of women as compared with the group of men. We find on the one side the prejudice that the difference is extreme and that women are unfit for important business positions; on the other side the equally superficial idea that there exists no difference between the mind of men and women and that women can therefore fill any place. The scientific group psychologist must take a middle stand.

Careful experiments have thrown light on the differences of memory, attention, feeling, and other mental functions in boys and girls and in mature men and women. Such experimental results can easily be supplemented by social statistical material, by historical reports, and by the account of male and female achievements in civilization. The psychologist certainly cannot point to any one mental function which is present in all men and absent in all women, or vice versa. It cannot even be said that either sex possesses a characteristic trait in which some members of the other sex may not excel too. Yet such studies leave no doubt that significant differences exist. It would be superficial to claim that the mind of man or of woman is superior, but each has its peculiar points of strength and weakness.

The survey of a large field shows first of all that men vary more widely. Women are nearer to the average type. The extreme variations above and below the average occur more frequently with men. They show the greatest development of intellectual, emotional, and volitional powers in the case of scientific or artistic or political or religious genius, and the greatest criminal depravity. The average female mind is patient, loyal, reliable, economic, skillful, full of sympathy, and full of imagination; on the other hand it is capricious, over-suggestible, often inclined to exaggeration, disinclined to abstract thought, unfit for mathematical reasoning, impulsive, over-emotional. The good and bad features alike can be understood as the results of a greater emotional temperament in women than in men, and secondarily as the results of greater activity.

But the chief point is that in man the various contents of consciousness remain separate, while in the mind of woman they fuse. Her life, therefore, has more inner

unity, and she shows more readiness to devote all mental energies to one idea. But for the same reason she must be influenced by prejudices, must show a lack of logical discrimination, must be under the control of the present impressions and too little directed by the arguments which reason and memory supply. The practical outcome is surely that many commercial or industrial positions, even if the question of physical strength is entirely set aside, are hardly the right ones for women, while in many others they are decidedly to be preferred, again not considering the fact that for social reasons their working energy is less expensive.

Wherever a large number of women are working together greater emotional excitability must be taken for granted, even though there may be a number of individual women who have more the balance of men, while in any group of men we may find some individuals with female emotionalism. It has been found, for instance, that in a factory with thousands of women workers too many lose their heads in a moment of danger. In case of fire the probability would therefore be that they would not subordinate themselves to the rules which they learned in the fire-drill and that the sight of flames and smoke would paralyze their rational action. Hence it has been found more effective to have such a fire-drill only for the men but in the halls to have a few strong men at work whose chief function in a moment of danger is to force the women in the right direction toward the exit and to direct their hysterical excitement toward a place of safety. Of course this is one of the cases where a true group-psychological observation is used in a rather one-sided way. One psychological danger is avoided, but it may be that this method will introduce psychological dangers of other kinds.

This emotionalism of women not seldom makes them the better candidates for a place. It is not by chance that most men in responsible positions prefer women to men as confidential secretaries. Woman's loyalty and devotion leads her to sink her own personality in the work of her employer more than does a man, who is always inclined to keep his independent personal interests in the background of his mind. She is accordingly more discreet and it is an entirely misleading prejudice of popular group psychology if the contrary is claimed and if it is insisted that women are less able to be reticent about confidential affairs.

Correlation Psychology

Group psychology, however, is only one method by which the selection of the mentally fit individuals can be simplified. It remains a rather unreliable method, as it can offer only probabilities and it is at present entirely undeveloped; for instance the group psychology of the different races has not gained really scientific character.

We have another method which seems to lead to the same end and which seems to open a much wider field in the science, which is technically called "correlation psychology." The fundamental idea of this correlation psychology is that special mental functions regularly occur together with certain other physical or mental traits. The principal advantage of such observations is clearly that the presence of one feature would be a signal which allows us to expect the presence of another trait. If for instance we could find that the ability for arithmetical calculation goes together with talent for business administration, then it would be easy to find the men who are fit to guide a business. We should only have to test all applicants for the position by giving them some large

figures to multiply in the head. Those who did it best would be our ideal candidates for the place in the office.

But does such a correlation between the multiplying of figures and the conducting of business exist? To find out, the student of correlation psychology might select ten men who are the strongest business administrators he knows, and ten men who have medium capacity for it, and ten men who, however intelligent in other respects, have proved to be poor business organizers. Take the case that he has found his thirty men of the three types. His next step would be to give to everyone a set of multiplication tasks and to make statistics as to how many seconds are required to solve the problems and how many mistakes are made. If he finds that the ten excellent business men are also the ten best in the calculation and the ten poorest business men are the ten worst in the calculation, he can take it for granted that such a correlation really exists.

If he were to find, on the contrary, that the ten strong business heads are on the whole weak calculators and that the ten poor organizers are strong calculators, he would call it a case of negative correlation; that is, the absence of talent for quick multiplication would indicate that there is talent for business, while the ability to multiply rapidly would speak against special ability for business administration.

In both cases, in that of positive and that of negative correlation, it would be relatively simple to discover the right man by a quick test. The fact is, however, that such an investigation would quickly lead to a very different result, namely, it would show that no strong correlation either positive or negative exists. Among those excellent business men there would be some who calculate well and some who calculate badly, and among the poor

business organizers some good and also some poor calculators would be found. Thus the idea of using that as a simple test for selecting the men would hardly be promising.

Yet if we made this inquiry, we should find that there is after all a certain difference between the good and the bad business man in the ability to calculate. The average of the ten strong men of affairs is somewhat superior to the average of the ineffective business men. But is that surprising? Does that indicate any special correlation between two independent mental functions? Certainly not. It only shows that those two functions have certain common elements, that a certain degree of intelligence is needed for both, and that while they remain distinct functions which are in themselves not bound up with each other, yet the common need of mental eagerness, mental quickness, mental adaptability, for both functions brings them somewhat into contact. The more intelligent person will have better chances in both directions.

This is exactly the trend which the study of correlation psychology has taken throughout. Many mental traits show such positive correlation that excellence in the one frequently implies excellence in the other. And then we have indeed the right to expect the existence of the one where we can discover the other. But in all these cases we have simply the effects of some common cause or directly some common element in the two functions.

SCIENTIFIC USE OF CORRELATIONS

No two mental processes which have neither common causes nor common elements are ever correlated with each other, either positively or negatively. They are simply independent of one another. Mathematical talent and musical talent seem to be slightly correlated. But

acuity of vision and musical talent or sensitiveness to odors and musical talent have nothing whatever to do with each other. Among musical persons are just as many who have strong acuity of vision as there are who are deficient.

In our practical life we are always inclined to believe in the existence of such interrelations. This goes into the midst of trivial functions. It is claimed that among smokers the friends of cigars and the friends of cigarettes present two different types of mind. The love for the cigar is correlated with earnestness, pedantry, and thoroughness, the love for the cigarette with superficiality, nervousness, and artistic temperament. The inclination toward sweet tastes and toward piquant dishes is thought to be correlated with different temperamental and volitional attitudes.

Laboratory psychologists have undertaken such investigations with exact methods. For instance all the students of a university were examined as to their ability to discriminate the pitch of tone, the heaviness of weights, the length of lines, and as to their sensitiveness to pain, their quickness of reaction, their rapidity of association, their acoustical memory, their discrimination of time periods, their imagery; all these functions were further studied with reference to their intelligence as expressed in the results of their university examinations. The outcome was that no definite correlations were found between these various elementary functions on the one side and the intellectual functions which the examination demanded on the other side.

Any surprising connections between apparently independent mental states have so far not been traced by exact experiments. The hopes which correlation psychology suggested for the selecting of individuals with

the help of easily determinable traits have so far not been realized. The study of correlations is very interesting, because it allows theoretical insight into the far-reaching mental connections. It shows how far apparently different acts have some common causes or some common elements. But their practical importance seems as yet negligible.

GRAPHOLOGY

This statement will be contradicted first of all by the graphologists. They will say that we can find a definite correlation between the details of the handwriting and the whole mental behavior of the individual. No doubt the handwriting must be acknowledged as a psychical-physiological function and if it were true that the place of the dot over the *i* or the steepness of the stroke or the height of the *f* or the distance between two letters or the form of the loop in the *g* is characteristically correlated with the good nature or the health, the political talent or the scientific ability, the modesty or the immodesty, the honesty or the dishonesty of a writer, we should indeed have a useful mental correlation. As we want an honest candidate and not a dishonest one, we should simply look up the particular features in the handwriting of his letter.

Such a claim, as is well known, is a very old one. Graphology has interested the world in earlier times even more than today. Yet the scientific psychologist considers these claims as wildly exaggerated. There is no doubt that the handwriting is expressive of the personality, as the handwriting is a form of movement, and every bodily movement which is carried out under the control of the mind must reflect the characteristics of the individuality. A person's walk and a person's way of speaking and every other expressive movement is determined by his

mental states. It is therefore perfectly justifiable to seek different types in the different handwritings and to recognize fundamental differences. An energetic character expresses itself in an energetic handwriting; an erratic personality can easily be recognized in the irregularity of his writing impulses. A specially neat writing will go together with neat mental behavior. We even have a right to speak of a certain artificiality and unnaturalness of handwriting which may be a symptom of similar mental habits.

In this way many features of the man may be discovered in a page of his writing, and everybody can recognize in a handwritten letter certain characteristics of the man which would be lost in a typewritten letter. Yet this is again only a case of the community of elements. If an energetic character writes an energetic handwriting, nobody will seek in it the correlation between two independent features, but simply the similar consequences of the same conditions. Those subtler, apparently inexplainable correlations, on the other hand, to which the graphologists have so often pointed, seem hardly a safe basis for judging a man from the products of his pen.

PHRENOLOGY

While the claims of the graphologists have become rather modest in recent years, another similar form of correlation psychology has been brought forward with many promises and with the assurance that these promises have already been fulfilled. The system which Dr. Katherine Blackford has made very popular nowadays in the American industrial and commercial world, the so-called Blackford employment plan, belongs in every respect to the sphere of correlation psychology. It is essentially based on the conviction that certain mental traits

are always combined with certain characteristics of the body, especially of the physiognomy of the face and of the hands. If a particular kind of work needs much patience and a certain type of mouth or nose or eyes is always connected with mental patience, it is easy to find the right candidate for the job by picking out among the applicants the man with the appropriate face.

This kind of theory reminds the reader at first of the old phrenological ideas which a century ago stirred up the popular world. At that time it was claimed that the traits of the mind can be discovered by the outer formation of the skull. No two skulls are entirely alike. There are many details in the contour of the head, and if the stronger development of one part indicates sympathy, and another sexuality, and another sense for beauty, and another honesty, and so on through a long list of mental inclinations, the phrenologist who has some training in examining the head by touch would be the ideal adviser of every employer of a working force.

The misfortune of that phrenological theory of old was that it was founded on pure fancy. The fact that the outside of the skull is not at all a clear indication of the surface of the brain is only a minor objection to that fantastic system. The really fundamental objection is that all those mental traits which the phrenologists sought in particular locations on the surface of the brain were soon recognized as very complex combinations of mental elements which cannot possibly be connected with one definite area in the brain and least of all on the surface of the brain. A sense for business or a sense for architecture, a love for one's country or for one's family, involves millions of mental processes and these processes are distributed over the whole brain.

Phrenology was therefore very soon discarded by every serious thinker and it sunk to the level of fakes.

It is a pity that while it has died out altogether in Europe, in America many humbugs, often well-meaning ones, still mislead certain classes of the public by these old phrenological absurdities. Even in educational departments of industrial establishments such silly pictures of phrenologically divided heads can sometimes be seen in which the surface of the head is mapped out into little square areas, each of which serves a particular complex mental function. This survival of a grotesque absurdity is typical of the hindrances which a sound study of psychology still finds in its way. Is the Blackford employment plan on a higher scientific level?

The Blackford Plan

It may certainly be acknowledged that the correlations on which the plan hangs are not simply fancies, but are backed by earnest theories, and it may be added that these theories, which are deduced from certain speculations of modern anthropologists, are brilliant and interesting. The whole method starts from familiar popular observations. "The high brows and lean cheeks of the thinker and scholar, the high, large nose of courage and aggressiveness, the thick neck and fleshy lips of sensuality, the thin lips and cold eye of cruelty, the round face and full figure of good nature, the dark eyes, hair, and skin of revenge, the keen sharp face of the scold, and the broad flat face of phlegmatism, are as familiar in literature as they are in everyday life." It may be said at once that this familiarity in literature is in itself no proof of correctness. It would not be difficult to show that high brows and lean cheeks can be discovered in faces of men whom no one would denounce as scholars, and that many

true thinkers and important scholars have neither the lips nor the cheeks demanded for them. But such superficial observations would anyhow not give a theory and would surely never lead to a point at which definite schemes for the selection of applicants for positions could be proposed. The theoretical background is gained by the connection of man's color, form, size, structure, texture, and so on with the racial history.

We have for instance the difference of the blonde and brunette races. The anthropologists have discovered that the pigment of the brunette was originally a protective development of the organisms exposed to strong light in southern climates. The pigmentation in both men and animals has been evolved for the purpose of excluding the short-waved rays of the light from the tissues of the body, as they exhaust and destroy living protoplasm. "The primitive man was brunette and blondeness has been evolved as the result of forced or voluntary migration to cold, dark, cloudy northwestern Europe; the climate of this part of Europe is rigorous and severe." Accordingly blondeness was developed in a climatic environment which permitted the survival only of those who were most vigorous, most intelligent, most aggressive, most creative, most active.

The brunette was characteristic of the warm, pleasant climate where the necessities are comparatively few, where man needs less food, less clothing, less shelter, and where everything is easy to obtain from the abundance of animal and vegetable life around. The outcome is that "the normal blonde has positive, dynamic, driving, aggressive, domineering, impatient, active, quick, hopeful, speculative, changing and variety-loving characteristics, while the normal brunette has negative, static, conservative, imitative, submissive, cau-

tious, painstaking, patient, plodding, slow, deliberate, serious, thoughtful, specializing characteristics. * * * In applying this law of color to people of the white race the method is simple. The less the pigmentation, in any individual, the more marked will be the characteristics of the blonde in his mental and psychical nature. The greater the degree of pigmentation, the more marked the characteristics of the brunette."

Similar interesting anthropological arguments lead to the discrimination between the characteristics of people with large, high noses and low, flat noses. It is quite certain that only a high, prominent nose is best fitted for the colder climates where the cold air of the surroundings must be warmed in the passages of the nose. On the other hand the northern air is rich in oxygen and therefore it is less necessary to breathe in large quantities of air. In the hot climates the air is rarefied by heat and contains less oxygen. A short, wide air passage such as a flat nose offers is therefore best fitted for the introduction of sufficient oxygen into the lungs. Moreover the flat nose, with its short, wide, low-bridged form and its large round nostrils needs less muscular activity in breathing and is appropriate for the warm climate in which all muscular and organic reactions are weaker. Again it can be understood that "when man migrated into colder and harsher climates, conditions were changed. The air being cold was more condensed and contained more oxygen in proportion to its volume than the air in the warmer climates. Short, wide air passages to the lungs were not necessary. On the other hand, they were a disadvantage, as cold air quickly killed off those with the flattest, widest noses and shallowest lungs, just as it kills negroes by pneumonia, bronchitis and tuberculosis in our northern climates today. Since those with

the shortest and flattest noses were killed off by climate, it follows that those with the longest, highest, narrowest noses survived. The high, thin nose was therefore evolved in the same environment with blondeness. * * * It was evolved in the midst of environments necessitating great activity and aggressiveness. It is therefore always associated with positive energy. The low short or flat nose is associated with comparative inactivity and moderate or deficient energy." Other similar anthropological speculations refer to the form of forehead and mouth and chin which together give a more convex or flat or concave type of face; again others to the texture of the skin, to the hands, and so on.

The use to be made of all these interesting ideas is very simple. We must analyze the requirements of the position and then see which of the mental traits needed can be expected from a concave face or from a convex face, from a long-fingered or from a short-fingered, from a blue-eyed or from a brown-eyed, from a fine-textured or from a coarse-skinned man, and then we can easily select among the candidates.

THE ERROR OF THE BLACKFORD PLAN

But unfortunately the prophets of this new creed have to make a concession which fundamentally destroys all their premises. We may know what the color of the hair indicates and also what the convexity of the profile suggests, but the knowledge of these two groups of mental traits corresponding to each of the two physical traits does not tell us which mental traits result from the combination of the two. From merely knowing the characteristics of hydrogen and the characteristics of oxygen we do not at all know the traits of that combination of hydrogen and oxygen which we call water. The book says di-

rectly: "Combinations of the nine elements of human character in different proportions yield characteristics not indicated by any one of the nine. Two men may be almost exact counterparts of each other in texture, size, form, color and consistency, but on account of a difference in proportion, expression and condition one will be a lazy, shiftless, careless, irresponsible burden upon society, and the other a successful financier." As soon as we acknowledge that most fundamental traits result from the particular combination of the various anthropological features, we have given the case entirely out of our hands.

The speculation concerning the significance of any one special feature is vague enough and probably misleading enough. Not only in exceptional but in very many cases energetic brunettes and lazy blondes can be found. But if it comes to the combination of the physical traits and their effect on the mental symptoms, we have not even such racial speculations at our disposal, but we are entirely dependent upon imagination. Then the decisions become arbitrary in every respect and in no way better than all the well-known current prejudices which men form in their contact with others, mostly by generalizing some chance experiences and afterward projecting their pet theories into daily work. In the last report of the National Association of Corporation Schools, the agency instructor of the Travelers' Insurance Company in Hartford, Connecticut, says:

> My experience warns me against the big, wellbuilt, handsome man. The man who is fat, rather gross in his avoirdupois, is rarely ever a success as a salesman. The little fellow is often so full of snap and ginger that I am quite likely to have my doubts overcome by my love for the push and briskness of this man. They are at quite a disadvantage, especially in gaining an opening, a most important part of saleswork. The big, hand-

some fellow has made his way so much on his shape that his gray matter runs in shallow rivulets. He gets in to his man but cannot stand a trying mental combat. As to shade of complexion, I am inclined to shun two types, the oily-skinned, dark complexions and the extreme blonde with coarse complexion. The former is apt to be crafty and somewhat unprincipled, the latter is too fastidious and usually unreliable when the fair sex is around.

Arbitrary pseudo-theories of this kind can be discovered in most cases when men have dealt for many years with the selection of applicants, and the theory of one always contradicts that of the next. There is every time a bit of truth in it, and certainly those speculations on race evolution also have such a core of truth, but the actual conditions of mental life are far too complex to allow such simple rules.

IN WHAT THE BLACKFORD PLAN SUCCEEDS

The fact that the Blackford employment plan has found so many friends, especially in the Middle West, can easily be understood. The application of this system has indeed resulted in an improvement of the working force wherever industrial establishments employ Blackford counselors. The mistake is only in connecting these improvements with the details of these biological fancies, instead of connecting them with the fundamental fact that a systematic method is introduced into the process of selecting applicants.

In most of the mills and factories the employment is carried on without any principle of selecting applicants at all. The appointing and dismissing is left to the administrative periphery. There is no central organ in the establishment by which this most important function is uniformly organized, and this means that it is not put

into the hands of specialists. The appointing and dismissing is treated as a kind of side function for anyone in a higher position instead of its being made the special function of experts who have nothing to do but to study the problems of selecting the right persons.

Wherever the appointment is taken out of the hands of the scores of foremen and heads of the various departments and is transplanted to a central bureau in which no other work is done but the selecting of men and women for all positions in the establishment, a definite advance will be made, however unsatisfactory the special methods may be which are employed in that central office. It will at least remove the carelessness and thoughtlessness and superficiality with which this most momentous activity is usually carried out. The insisting on the centralization of the employment function is the real source of success for this new employment plan. This centralization ought to be established everywhere, but this does not endorse or even in the least excuse the particular prescriptions of this anthropological pet plan of today.

Tests for Mental Traits

If the existence or absence of mental traits is to be found out in the interest of the positions to be filled, we have after all only one really reliable method, and that is to observe that mental trait itself. The help which we get from group psychology is not to be disregarded, and the well-trained observer will also be able to get some slight suggestions from the physical appearance and the features of the physiognomy. But an exact, reliable, and really satisfactory result can after all be hoped for only from the direct measurement of the special function.

If a place is to be filled, the first requirement is therefore a definite and satisfactory study of the mental traits

and abilities needed for the best work in the place, and secondly an exact examination of those required mental functions in the individual case. If a position needs a good memory for figures, or a long continued vigilance of attention, or an ability for foreign languages, or quickness and exactitude of motor reactions, or a quick understanding of signals, it is certainly not enough to know that such an ability frequently occurs in a certain race and still less to rely on the belief that it occurs together with a certain handwriting or with a certain nose; but the memory or the attention or the speed of mental action must simply be measured. That is psychological work. If the employment is really to be regulated by experts, these places of experts must be filled by trained psychologists. No imitation of true psychological methods can help. The substitute is not only less good, but directly misleading.

This does not indicate that the psychological examination must demand the real performance of the work for which the candidate is to be appointed. If that were the plan, it would simply go back to a trying-out, and as the true trial would need long observation, we should fall back to the old method of keeping a man in a place and throwing him on the street when lack of good results suggests that he is not fit for the place.

The fundamental difference of the psychological method is the application of so-called tests by which the mental function is isolated and is exactly measured, while it is applied not to the complex tasks of practical life, but to simple, artificial material. We must consider these mental tests and their practical application.

TEST QUESTIONS

1. What is meant by group psychology?
2. How may group psychology be applied in hiring men in the mass, as for railroad construction work?
3. What are some of the practical applications of group psychology as to age? As to sex?
4. What is meant by correlation psychology?
5. To what extent would you rely upon a person's handwriting in forming an estimate of his character?
6. Is there any value in the study of phrenology? Do you use it with results?
7. Upon what theory is the Blackford employment plan based? To what extent is the plan useful?

CHAPTER XVIII

MENTAL TESTS

Testimonials and Certificates

If we wish to find out whether a man or woman has or has not certain desirable mental features, we can carry on our examination in several ways. First we may look backward and inquire into the life history of the person. His experiences, his successes and failures, an account of his studies and of his reading, of his training and of his work, may quickly show us some of his strength and some of his weaknesses. Much of this account can be found condensed in testimonials and certificates, in letters of reference and similar data for which other judges take the responsibility.

Self-Observation

Another way on which nowadays emphasis has sometimes been placed is the self-observational method. The applicant has to fill out a blank in which his replies indicate the presence or absence of various important mental functions. He himself has to write whether or not he has good memory, whether or not he is quick, modest, courageous, patient, industrious, temperate, honest, interested in reading, and so on. Sometimes sheets are printed with a list of mental qualities which comprises every important feature of the mind and the candidate is to indicate whether he feels himself strong or neutral or weak in every point.

Such a method is psychologically very unsatisfactory. We would have to know the man exactly beforehand in order to determine what value can be given to such self-observation. The modest man would rate his abilities far too low; the immodest pusher would rate them far too high; and whether he is modest or immodest we should know again only from his own estimation. Some very conscientious candidate may tell us that he is lazy and dishonest, but the chances of that are certainly very small.

If such a method is used at all, care ought to be taken at least that the questions are not formulated, as is usual, to ask whether that valuable quality is present or is not present but so that the answer always has to decide between two equally good qualities. If you ask a man whether he is able to do his work quickly or whether he is unable to do so, he will hardly acknowledge that he is of a phlegmatic type, but if you ask him whether his tendency is to do his work quickly or rather to do it deliberately, his natural inclination will come out, as his trait on either side will appear to him as a virtue.

DEFECTS OF THE SELF-OBSERVATIONAL METHOD

But the chief defect of the method lies much deeper. A man does not know his mental qualities. We know some very glaring defects of our mind. But the average man fulfills or neglects to fulfill his daily duties without really thinking about his own mental qualities and without being able to state them in any reliable way. He has no idea what kind of attention or memory or imagery or will lies at the bottom of his mental behavior. He does not know his peculiar traits in their general tendency and still less in the subtle details which are essential for his success or failure in a commercial or

industrial position. The exact experiment alone can determine these individual differences. Well-selected mental test experiments constitute the only method by which the mental fitness of men for special work can be found out beforehand in a reliable way.

It is only essential that the aim of the tests always be kept in mind. The purpose is to become able *to foresee the individual's mental behavior in certain complex practical situations from the results of elementary actions under measurable experimental conditions.* The purpose of the experiment is not simply to anticipate the whole situation which life may bring. That would not be a test; that would simply be a rehearsal. If we want to examine whether the man has the rapidity of mental action which is needed for the driver of a motor car if he is to avoid accidents, we do not make a psychological test if we put him on an automobile and watch him for a month and notice how many children he runs over. The psychologist would analyze the requirements into their various elements. One of these elements would be the rapidity of action in response to a quick visual impression. He would measure this particular rapidity by a series of experiments in the laboratory room. There an electric apparatus is arranged by which a picture is suddenly thrown on the wall, and the candidate holds a lever in hand as if he had to change the direction of a car. As soon as the picture flashes up he has to move the lever as quickly as possible. This lever itself has electric attachments, and the time from the flashing up of the picture to the motion of the hand can be read from the electric clock in hundredths of a second. The same reaction may be studied for the foot which presses the clutch or brakes.

The individual differences between this element of the chauffeur's activity in the case of the fit man and in the

case of the man who is too slow can be brought out by a short series of reaction measurements which may be completed in ten minutes. In the same way all the other parts of the chauffeur's work can be reduced to their mental components and each can be reduced to a simple experimental test. If any one of these necessary parts is lacking or insufficiently developed in the mental make-up of the candidate, he ought to be eliminated at the start. A mental chain too is only as strong as its weakest link.

Observation of the Subjective Factors

The most important condition for real test work is the careful observation of the changing subjective factors. The feeling-mood of the subject, fatigue or freshness, attentiveness or distraction, familiarity or unfamiliarity with the material, prejudices against mental examination, the liking or disliking of the experiment and of the experimenter, may have strong influence on the results. The most immediate way of overcoming at least the smaller fluctuations of the subjective states lies in the systematic repetition of the test. Yet even then it must be considered that the repetition itself changes the subjective state and creates a familiarity with the method and a training in the reaction, perhaps even an increasing dislike of the test. One or two tests can never give a satisfactory basis for a judgment, as there are too many varying mental factors always at work to push the result in one or another direction away from the central value of the underlying disposition.

The mental states which may be explored by such test methods cover sensation and perception, association and memory, imagination and abstraction, the whole manifoldness of psychological attitudes and activities, such as attention and inhibition, discrimination and decision, feel-

ing and emotion, suggestibility and energy, intelligence and will. In every one of these processes a great variety of special phases can be followed up. A mere testing for memory in general or for attention in general or for energy in general would be utterly misleading. We know how in practical life admirable courage before physical danger may go together with cowardice in the world of convictions, how excellent memory for words may not exclude a far-reaching deficiency of memory for colors, how the most energetic will in dealing with other persons may be coupled with deplorable lack of will-power in overcoming one's own desires.

The subtlest differentiation of the tests is accordingly necessary. The variety of test forms is naturally unlimited, but in order to make the results comparable it is very desirable to standardize the material to be used. If a picture with many details is used to test the fidelity of the subject's report, one picture may be no better than any other. But as soon as one set of pictures has been chosen, it is certainly desirable that later tests with other men be carried on with the same pictures in order that the results may be referred to an average standard.

Commercial Psychological Laboratories

It must be hoped that laboratories in which such tests are carried out by psychological experts will become attached to large commercial and industrial establishments as essential parts of a centralized employment office. Moreover such institutions ought to be established in connection with municipal vocational bureaus which are to help boys and girls who leave school to find practical positions for which they are really fit and in which they have fair chances to be successful. Finally it may be expected that private psychological institutes, managed by

consulting psychological engineers, will be put at the disposal of the public in a commercial way in order that the small business company may send an applicant to such an establishment for careful testing. The most essential demand, of course, is that not only the mental functions of the individual be tested, but that the psychological requirements of the particular position be carefully analyzed by an expert psychologist. As long as such experts are rare, any intelligent business man can determine at least the essential psychological requirements of his positions for himself, if he has ever gone through a careful study of the fundamentals of psychology.

Practical Tests

tests for sensations and perceptions

We may review at least some of the most accessible methods which could be applied even in a small commercial industrial laboratory, leaving out of consideration the subtle methods which would demand the equipment of a university laboratory. We may leave out reference to the various tests of sensations and perceptions, including the perception of space and time. Tests of this kind are on the whole not very important for commercial and industrial purposes, if we omit consideration of those more physiological questions of short-sightedness, astigmatism, color-blindness, and similar deficiencies of seeing which may be extremely important in many positions. In others touch and taste and smell are of equal significance and certainly every laboratory ought to be provided with all the means for testing the senses when there is need for it. But we have to consider more especially the higher mental processes, and may turn our attention first to

the memory-ideas and to the whole field of reproduction and association, a field in which the possible tests are practically innumerable.

TESTS FOR MEMORY

The natural beginning is the test of the ability to recall earlier experiences. The applicant has to describe the memory-reproduction of a visual or acoustical or tactual experience of the past. The question may be how far he can see before his mind a street scene in colors, in movement, in sharp outlines, how far he can reproduce in his consciousness the various sounds, noises, and melodies. The next question may refer to the ability to reproduce a series of numbers, words, nonsense syllables, geometric figures, pictures, in the order in which they were presented. Variations of the experiment may refer to the quality of the material, to the number of objects, to the time of presentation, to the time interval between presentation and reproduction, to the senses to which it is presented, to the effect of repetition, and to many other psycho-physical conditions. One kind of material can never simply be substituted for another. Experiments with disconnected words are very different from those with meaningless syllables.

The methods of the tests are manifold too. The experiment may determine the number of members in a series which is retained in memory after a certain number of repetitions, or the number of repetitions necessary for the series to be reproduced with complete correctness. Or we may study the number of cases in which prompting is required to enable the subject to render the series. Or, as would be necessary with colors or pictures, the method may demand the measurement of the number of objects which can be rearranged in correct order or in

which a substitution would become noticeable. A neat test for the rapidity with which mere repetition produces memory connections is the so-called substitution test in which the subject learns to connect the nine digits with nine geometric symbols.

TESTS FOR ASSOCIATION

Such tests of learning lead to the so-called association tests, in which a word or a picture, or another visual or acoustical or tactual stimulus is given, and the subject is asked to make known the first idea which associates itself with the perception. The typical form is the calling of a word with the request to give as response the first new word which comes to consciousness. The experimenter shouts "house," and the subject answers "chimney" or "garden" or "window" or "mortgage" or "brown" or "small" or the rhyming association, "mouse," or anything else which first rushes to his mind. A long list of such responses will furnish the material for a variety of observations. First it shows the sphere of experiences and the direction of personal interests. But more essential for the purpose of applied psychology is that it further shows the associative tendencies of the mental mechanism.

We have only to classify the associations from perhaps a hundred words with reference to their external and internal connections and to subdivide both groups. There may be associations which refer strictly to the similarity of sound of the words, others in which the words have been connected in earlier experience, others which are based on the space or time connections or their objects, others in which the relation of the objects is one of similarity or of an internal reference. The individual differences of the prevalence of certain groups are very

striking. When questions of life-work are involved, it seems that the most significant inquiry refers to the individually different tendencies of co-ordination, subordination, and superordination. The mind which at once links with a concrete object some co-ordinated object, like table-chair, is a very different mind from that which thinks of a superordinated idea, like table-furniture, and again different from the mind which thinks of a subordinated idea, like table-drawer.

Another aspect of the association experiment is the time duration of the process. If the inquiry were carried on for the purpose of theoretical psychology, the time between the seeing or hearing of the word and the speaking of the association would have to be measured in hundredths of a second. But for the test of individual differences in the interest of practical purposes, a simpler measurement in fifths of a second can give satisfactory service if a long list of associations, at least fifty, is secured. If not even a watch with fifths of a second is at our disposal, a still simpler method may be applied. Instead of measuring a large number of single association times, we may be satisfied with the measurement of the total time needed for a whole series of about fifty words. In such cases a typewritten list of words would be covered and the cover shifted from word to word each time when an association for the preceding one has been formed. As each association would vary between three fourths of a second and perhaps three seconds with an average of one and a half seconds, the time for such a series of fifty would be more than a minute and could easily be measured with the second dial of a watch.

From this starting point the association experiment may move in various directions. Instead of calling only the first word which comes to consciousness a whole train

of ideas may be expressed and the interest will then refer not only to the content of the words but also to the more formal aspect, for instance, to the tendency to return to the first word, or to move in side-lines of thought, or to repeat words, or to jump to disconnected words, or to prefer large clusters of nearly related words.

TESTS FOR ATTENTION

(1) Tachistoscopic Test

The mental tests for attention can easily be adjusted to many different problems. The classical form of the test for attention is the "tachistoscopic test." A tachistoscope is an instrument for quick, short exposure of a picture. A falling screen with an opening may expose the visual field for a measurable fraction of a second, or a photographic shutter may perform a similar service, or the light which falls on the visual surface may be cut off and admitted only for a very short time by an opening in a revolving disk or a similar device, or a pendulum apparatus may produce optical impressions in quick succession, each presented for an instant. In each case letters of figures or words, connected or disconnected forms, pictures, and so on, may be used, and the number of elements attended, their position and their relation be studied.

The number of words which can be grasped in one such pulse-beat of attention is almost as large as the number of single letters which can be attended in the same time. At every test for the purpose of individual analysis such facts of general psychology must be carefully considered. It would be utterly meaningless to compare the number of letters recognized by various individuals if in one case disconnected letters, in another short words, were

given. Instead of examining the number of elements recognized in one act of attention we may study the number of repetitions necessary before all the elements are correctly recognized.

(2) Span of Attention and Influence of Preparatory Setting

The next step is marked by attention experiments in which the visual object contains many unequal elements, such as form, color, position, and the attention is turned beforehand to one of the various aspects. Cards may be exposed, seen through a photographic shutter, which are covered with crescents, triangles, squares, crosses, and circles of different sizes and different colors. The ability to concentrate the attention on the color only or on the form only can there be studied from various points of view. Such little experiments on the span of attention and on the influence of its preparatory setting can throw light on mental dispositions which become decisive for the life-work of the men in commerce and industry. From here we may also turn to experiments on suggestion and suggestibility. Typewritten words which contain misprints may be exposed for a small fraction of a second and the suggestive influence of the familiar word on the reading of the mutilated word may be examined.

A simple test for suggestibility, especially of uneducated persons, is a comparison of circles of equal size in each of which figures of different denomination have been inscribed. The suggestible person considers the circle with the figure 79 larger than the circle with the figure 21. Other forms of experiments in visual suggestibility introduce suggestive questions in order to mislead the subject's account of the details of a picture which has been shown to him. Or we may measure suggestibility by

seeking the point at which an expected warm sensation or an expected galvanic current will be felt in an electrode, and so on.

(3) Interests and Inclinations of Attention

This leads to the experiments through which the individual direction of attention and the correctness of the apprehension is studied. The most usual form is the showing of a complex picture and the request for a description of all that has been seen. But this test evidently involves other functions besides attention and interest. The power to recall the first observation and to express the report in the form of language is here no less under examination. The test is of the highest importance, as it casts light on the ability to give reliable reports. The mere picture experiment is the simplest form, but ought to be accompanied by the exhibition of more or less familiar objects, such as bric-a-brac or tools. The reports made by the subjects should be examined not only with reference to the number of correct and incorrect data but also with reference to the choice of details. They indicate the general interests and the types of description, that is, whether the description shows more an observational or an imaginative or a scholarly associative or an objectively descriptive tendency.

As a test which quickly shows the interests and inclinations of attention, it is sufficient to have cards with lists of words, in which different interests are represented by ten words each. A list of fifty words, for instance, may contain in irregular order ten words referring to farming, ten to factory life, ten to banking, ten to salesmanship, ten to transportation. The subject is asked to read them aloud and to decide which of those five groups is represented by the largest number of words. The number is

usually overestimated in that group in which the subject is most interested. The temporal relations of the attention may be tested at first by exposing a printed word and examining how long it can be looked at with the consciousness of its meaning and when its meaning begins to crumble. For the study of the fluctuation of attention faint acoustical stimuli, such as the ticking of a watch, optical stimuli, such as grey circles of decreasing light intensity on a white background, ought to be used.

(4) Endurance of Attention

Among the many tests by which we measure the power of attention to remain continually at its height, the most popular in the laboratory is the cancellation test. In a printed page a certain letter, usually the *r*, or several letters, *a* and *r*, are to be crossed out as rapidly as possible. Counting dots is frequently used too. Or rows of figures are printed one below another and the subject has to write the sum or the product of two neighboring figures as quickly as possible beside them. Still more complex functions are involved when a story is typewritten in such a way that in every line several blanks occur in the midst of words. Only a wide-awake attention can supply the missing letters. Where it flags the time will become abnormally long and letters will creep in which may fit the isolated word into which they are written, but not the meaning of the whole sentence.

The division of attention is open to a variety of tests. Impressions belonging to the sphere of the same sense or to different senses may be presented together. The eyes may read while the ears listen to a different text and the amount of remembered material is recorded. Or the attention for sense impressions is deflected by activities; learning and writing, listening and counting, may be combined.

Most of the attention experiments may also be applied as tests for the actual fatigue which has set in or for the degree of the tendency to fatigue, and finally for the measurement of the restoring of psycho-physical energy. The study of fatigue and recreation, however, is not confined to methods which measure the variations of attention. Indirect symptoms of fatigue may be considered too, such as the changes in the distance at which two tactual stimuli are just recognized as two.

It is evident that some of these tests of endurance of attention involve at the same time more or less complex functions of intelligence. We have seen that the degrees of intelligence depend on the one side upon the energy with which the idea of the end controls the inner mechanisms of reproduction and inhibition and on the other side upon the skill with which the available material of the mind is adjusted to the realization of the purposes. Simple tests can easily unveil individual differences in both directions. We may examine, for instance, the rapidity with which missing words in a sentence are supplied or with which correct conclusions are drawn or with which wrong conclusions are recognized as such. Or we may give a number of words and the aim is to formulate a sentence with meaning which contains all those words. Or the letters of a word are given in disorder and the right word is to be constructed from them.

We may offer, for instance, a card marked "Animals," on which the following ten groups of letters are printed:

Tetrul	Dykeno
Cidolocer	Jifelylsh
Bylefrutt	Serdip
Selquirr	Arotillag
Etalenph	Galliro

How long does it take the subject to recognize them as the following ten animals?

Turtle	Donkey
Crocodile	Jellyfish
Butterfly	Spider
Squirrel	Alligator
Elephant	Gorilla

How many does he not discover at all? In the same group of intelligence tests, we may classify various types of puzzle games or tests in which wooden pieces have to be put together in the shape of a square or of a cross or tests in which a box has to be opened by unfastening cleverly constructed bolts which are interconnected. The intelligence tests blend with those which show the range of knowledge and of acquired ideas.

Strictly speaking, such an inquiry is no longer a psychological test. It is not a question of the capacities of the mind whether the individual has learned foreign languages or has musical or geographical or scientific knowledge. Yet the foresight as to the mental behavior of the young business man is, of course, highly dependent upon the character of the associative material, the readiness of the dispositions, and the organization of the ideas which he has gained from education and instruction. Tests which by typical questions determine the actual mental results of learning are for many purposes indispensable.

TESTS OF FEELINGS

Tests of feelings naturally start from the simple evaluation of sense-impressions. Color strips are shown on a black background and their feeling-value is measured on a scale usually of 7 degrees, in which 1 means very at-

tractive, 4 indifferent, and 7 very disagreeable. Or two such strips are shown and the subject has to decide which of the two is the more agreeable. The next step is to combine two color areas and to judge on the attractiveness of the combination. In all cases the interest refers not only to the qualitative character of the feeling but also to the constancy with which the individual gives the same feeling-judgment for the same impression.

From simple stimuli we move forward to more complex combinations in space and time. Space forms from the simplest to the richest are aesthetically graded, and rhythmical or unrhythmical time forms, marked by clicks, are exposed to the aesthetic judgment. Or the subject has to divide lines in the way most pleasing to him, has to change color combinations, has to vary time intervals, has to balance unequal space objects, as in the composition of a picture. Individual tastes, eccentricities, abilities, and uncertainties quickly come to expression and are of considerable interest for many practical purposes.

The emotional tests ought to be extended to include a study of the expressions and of the physiological accompaniments. The pulse curve and the breathing curve can be taken as part of the test work. The changes in breathing and heart action are particularly important, as they allow us to trace the time relations of the emotional excitement; alterations which pass rapidly with one subject show long after-effects with another. We can also create experimental conditions for expectation, for surprise, for disappointment after tension, for slight anger or a bit of joy; and we can supplement the actual affections by memory-images of earlier emotional experiences and finally by the suggestion of emotions through poetry or pictures. Other tests refer to the influence of feelings on attention, of the feelings on one another. There are individuals

whose feelings mix, others whose feelings inhibit one another, others whose feelings strengthen one another.

MEASUREMENT OF REACTION TIME

Another general group of mental activities which the test may explore is made up of the voluntary processes the study of which is approached by the probing of the involuntary actions. As examples of involuntary activity we may study the decrease or increase of pressure by the changing tension of the hand muscles as a result of the seeing of various colors or the hearing of various tones. Involuntary movements are easily tested with simple arrangements in which the arm, supported by a loop, swings free and writes on smoked paper a record of the smallest movement impulses under the influence of various ideas of localities. Voluntary movements must be examined with reference to rapidity, accuracy, co-ordination, effect of practice, inhibition, fatigue, and so on.

The most popular experiment is the measurement of reaction time. The typical form demands a finger movement performed by the subject as quickly as possible after the flashing of a light or the starting of a sound or a tactual contact. In more complex experiments the reaction movement may be a motion of the lips in uttering a sound, and this form of reaction allows an unlimited complication of the stimulus and the inclusion of any associative process between the stimulus and the spoken word. The visual object exposed by a falling screen which starts the chronoscope may be a letter, a color, a figure, a word, a picture, or a printed question, and the reaction utterance may be an indication of mere perception or recognition or associating the name or associating a conception or a translation or an answer to a question. But the simple reaction time without speech may also be

varied so as to lead to a complex choice of reactions. Different fingers, for instance, may rest on different levers and start different movements in response to different color stimuli. The more complex the processes involved, the greater are the characteristic individual differences.

The quickest possible succession of mental impulses is usually studied in tapping movements. An electric rod held between the fingers and touching a metal plate may supply a neat record of the rhythm and its irregularities. The test is to be taken with the right and the left hand for various time periods. But even a mere tapping with a pencil point on a slowly moving paper may furnish some indication of the individual abilities.

Tapping movements, however, are still more suggestive for the analysis of the individual dispositions when not the quickest possible impulses are chosen but the most natural personal rhythms. If such slow movements are recorded, perhaps by tapping on a rubber bulb which by air transmission through a type moves a lever that writes the waves on a revolving drum, the most subtle changes of motor impulses can be studied. In a parallel way the natural rhythm of writing, speaking, reading, walking, hammering, can be studied with important consequences for technical psychology. The examination of the precision and accuracy of movements may be started with simple aiming tests where quick movements controlled by the beats of a metronome are made with the intention of hitting certain targets.

The simplest form demands only that the subject have before him on the table a large sheet of paper covered with a dozen small circles. He holds his pencil at the central circle and in the rhythm of the metronome beats has to hit one circle after another, always returning with the pencil to his starting point. The distance of the

marks from the centers of the circles and the directions of their deviations are examined for the right hand and for the left, and finally in experiments in which the eyes are closed as soon as the movement of the arm is started. The mental control of the muscles at rest is neatly traced by a test in which an electric pin is held in the center of smaller and smaller holes in a metal screen. Whenever the pin comes in contact with the edge of the hole an electric lever makes a mark, and the number of such marks indicates the lack of steadiness. Tracing experiments, too, in which a pin is to be moved along the thin edge of an irregularly shaped metal strip may measure the accuracy of movement by the number of times the pin slips from the edge.

Many variations are possible in testing the abilities of the subject to form connections. One of the simplest forms is the experiment in which cards are to be sorted quickly. If a pack of cards is to be distributed in four heaps according to their suits and for each suit a definite place is designated, an automatism of movement will rapidly be formed; the test would then determine how many mistakes would be made if a new place for each of the four suits is prescribed. The learning process is perhaps most easily followed in the writing movements. Definite figures, such as a triangle, a square, a crescent, a circle, a cross, become associated with certain letters and the time necessary to master these artificial substitutions is measured. An important test refers to the dependence of voluntary movement impulses upon suggestion. The experiment may start with an arrangement in which the subject has to grasp quickly for one of twenty little color squares which are suddenly exposed to him. Among these squares one may be especially predominant by its size, one by its glaring color, one by its irregular position

in the visual field, and so on. Such suggestive influences may be directly brought into conflict with a preparatory will-resolution to grasp for some particular kind of square.

Actual Use of the Tests

The list of such simple psychological household experiments could be lengthened without end. They form the routine tests to be used in any combination. But just as in the workshop beside the simple routine tools, like hammer and saw and chisel, we must have complex machines for particular purposes, so in the psychological laboratory these elementary methods adjusted to the simplest psychical functions must be supplemented by methods which fit special complex mental situations. It would lead too far to follow these subtler developments of the science of tests with which the experimental psychologists of the day are engaged.

Motormen on Street Railways

When the task, for instance, was to select the men fit to become motormen on the electric street railways I found that the choice could not be made by analyzing their mental operations into elements. The function which is most important for them is a characteristic combination of attention and imagination and readiness to react. Only those who possess this gift can foresee sufficiently the probable movements of the pedestrians and of the vehicles and can through the whole time of their service hours at every moment be ready to slow up or to stop the car when danger is imminent. Those who do the work without this natural mental trend are responsible for the abundance of accidents which will occur on all street railways as long as the men are selected without

reference to their psychological make-up. It was therefore necessary to approach the solution of this problem by constructing a testing machine which would somewhat imitate the conditions of the street by moving points on a chart and to measure the right and wrong reactions of the candidate. It was possible to show that on the whole the men who succeeded in the electric railway service succeeded in the short tests, and that those who were failures in the tests were on the whole failures in the service. That is, a ten minutes' test could determine beforehand what the years of experience would show at the expense of the public.

NAVAL OFFICERS

In a similar way when the problem was to determine the fitness of a sea officer for his task of facing a quick

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E O E U O E O A U E O E

E E U E A O E O A E E O

A U E E U E U E E O E A

Card A

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O O U E O U O U O A O E

Card B

A E E E O U A E E E U A

U A U A O A O A O U A O

A U A U A A O O A E O A

A E U U E A U O O A A E

Card C

A A E U E U A O O U U E

U O U E O O U A A U U U

O U A O U O A U O A U U

E A U E E U A O E U E E

Card D

A O A E E A E A O O U U

A A U U A O O U E O E E

O E O U E O A E U U U U

E O E A A O E A E E U E

Card E

A A O O E U E U E O E U

E E A A U O O A O U E U

A O U O U E O U A A A A

E U O U E U O E U A U U

Card F

TEST CARDS

These cards are used for testing individual ability to make a quick decision in a complex situation, as for a chauffeur or a motorman. The observer is to decide as quickly as possible which of the four vowels is the most frequent. In cards A and B one letter occurs 21 times, while the others appear only 9 times. In cards C and D one letter occurs 18 times and the others 10 times. In cards E and F one appears 15 times and the others 11 times.

complex situation and of making the right decision, it was again necessary to reproduce in elementary terms the whole complexity of the situation. I proposed for this purpose a system of cards each of which bear 48 letters, consisting of the 4 capital letters, *A, E, O,* and *U,* in different proportion. A card had, for instance, 18 *A's,* 10 *E's,* 10 *O's,* and 10 *U's.* The 24 cards had to be sorted as quickly as possible in 4 piles according to the letter which was most frequent on the card. The first impression of such a card is perplexing, and the subjective feeling comes very near to that with which we face a complex situation. The results show that some individuals think quickly but wrongly, that others become somewhat paralyzed and delay the action, and that only the reliable persons quickly make the right decision. Measuring the seconds which this sorting of the 24 cards needs and counting the mistakes made and examining the quality of the mistakes allows a surprisingly neat analysis of the ways in which an individual behaves in a sudden complex experience.

TELEPHONE OPERATORS

But after all the most important method is not the construction of such particular tests for particular demands

but a fit combination of the elementary tests in accordance with an analysis of the vocational work into its partial functions. In this way I studied, for instance, the fitness of telephone operators, analyzing their complex activity before the switchboard into eight different simpler functions, each of which was examined by itself.

TRAVELING SALESMEN

To give at least one detailed illustration, I may analyze a recent concrete test for the selection of traveling salesmen for the American Tobacco Company. The company asked me whether it would interest me to select the ten best men for positions as salesmen. Out of a large number of applicants who responded to an advertisement they had eliminated those who for reasons of health or appearance or previous record seemed unfit. Twenty-seven remained as apparently good men for the places. Out of these twenty-seven I was to select the ten mentally best fitted. It would lead too far to give here my arguments for using the ten tests, each of which seemed to me to correspond to a particular need of the position, as the representatives of the American Tobacco Company described the practical requirements for these men who were to visit the various tobacco stores.

One of the tests was an attention test. Each of the twenty-seven men, who were together in a classroom, received a copy of the same morning paper, the Boston Herald. This contains eight columns. They were asked to begin with the first column and to cross out as quickly as possible every letter *r*. After a minute a signal was given and they had to begin the second column in which

they again crossed out the letters for one minute and so on, the eight columns in eight minutes. I had chosen a newspaper of the day because the news of the first page would work as a strong distraction of the attention. Assistants examined later how many *r's* were crossed out in each column and how many were skipped up to the last word which was reached in each column. One man, for instance, had in the first column 16 crossed and 3 omitted, in the second 28 crossed, 3 omitted, in the third 21 crossed, 2 omitted, in the fourth 29 crossed, 13 omitted, in the fifth 40 crossed, 7 omitted, in the sixth 33 crossed, 15 omitted, in the seventh 36 crossed, 11 omitted, in the eighth 32 crossed, 9 omitted. It is quite evident how his rapidity in the seeing of *r's* increases almost from minute to minute, as is shown by the number of crossed *r's,* but how his attention is exhausted after the third minute, as beginning with the fourth minute the number of omitted letters jumps from 2 to 13 and remains large in the successive minutes. With others the loss was still greater. One crossed in the first minute 21 and omitted only 1, in the last minute he crossed 20 but omitted 14. One began with 18, omitting 1, and ended with 24, omitting 16. On the other hand one began with 26, omitting 6, and ended with 28, omitting only 1.

The exact comparison of the various results allows a very clear insight into the attention type of the individuals. No two of the twenty-seven men showed the same results. We had there the steady men, the men who learn quickly from practice, the men who learn slowly, the men who fluctuate greatly in their achievement, the men who become careless after two or three or five minutes, the men who are careless from the beginning, and so on. We summed up for each the number of letters crossed and also

the number of letters omitted. On the basis of these two results we graded the twenty-seven men. In considering both lists we were fair to the men who crossed out many but who omitted many on account of their great quickness in crossing, and also fair to those who crossed out very few because they were so very deliberate and therefore omitted hardly any. The man who stood at the top of the list for not omitting any had done it so slowly that he stood twenty-fifth in the list for crossing out, because he covered such a small number.

Another test consisted of reading to all of them a little item of three newspaper paragraphs about a recent forest fire. It contained a considerable mass of details. As soon as they had heard the story, they had to write it down as correctly as possible. The assistant examined for each the number of correct details, recorded the absence of incorrect statements, the absence of additional, imagined details, and the presentation in logical sequence. On the basis of the results the rank of each was again determined.

A further list was secured by tests of memory for numbers. We read to the whole group of men at first several numbers of seven digits, then of eight, of nine, and of ten digits. It was examined how many each was able to write down afterward.

While this refers to a mechanical memory, the next test comes much nearer to the examination of general intelligence, in spite of its apparent form of a mere memory test. It is a test which the school psychologists have found especially valuable for the measurement of general intelligence. In reality it is an associational memory test for intelligence. A list of thirty pairs of words was read

to them, each pair consisting of two words which have an internal relation of meaning, like the following:

heart-blood
heat-humidity
stage-drama
wage-profit
telegraph-electricity
taxes-revenue
election-governor

After reading the list one of the two words was given, and they had to write down the other word of the pair. Again they were ranked according to the results.

This ended the tests which were performed on the twenty-seven men together. Then each man went through five rooms, in each of which he was tested in individual experiments. One was a tachistoscopic test. The man had to look into an optical instrument in which various geometric forms appeared interwoven. He saw them by flashlight illumination and afterwards he had to disentangle the various forms and to draw them independently.

The next test referred to his rapidity of reaction tested by measuring the time which it took him to sort forty-eight cards in four piles according to four different letters printed on them.

After that each had a test where the names of American cities appeared with their letters disarranged, only the first letter being in its right place. The list began with "Chicago," "Baltimore," and so on, for which "Cogaich," "Borimtale," were printed. The mistakes and, above all, the time were measured. This test appeared to the candidates like a puzzle game.

The last test referred to the ability of the individual to inhibit reflex movements. His eye was protected by a

heavy glass plate. A small hammer covered with a rubber cushion fell on the plate opposite the eye, and the question was how long it would take before the subject was able to keep his eye open when the hammer fell and to suppress the winking of the eyelid. The intention of this experiment is to bring out the voluntary control over the instinctive impulses.

We gained in this way for each man ten positions in ten graded lists, and we could add the numbers of the ten positions. If a man had been the best in every one of the ten tests, the sum would have been 10, and if he had been the worst in all, the sum would have been 270. The fact is that the smallest sum was 77 and the highest 241. These sums allowed a final grading, and on the basis of this last list I recommended the company to appoint those ten men who had the ten highest positions in this ultimate series which expressed the relative standing in all ten tests.

Individual Efficiency

There remains only one question which may be addressed to the psychologist, a question full of significance for anyone who seeks a career in the commercial or industrial world and who may face such psychological tests. How can we improve the mental functions and abilities and dispositions in our mind? How can we make ourselves ready mentally for a vocation where nature has not provided us with the right psychical equipment? How can we secure a wider range of attention, a better memory for faces, a deeper emotional response, a greater rapidity of will-impulse?

We have discussed this question repeatedly. We have spoken above all about the fundamental influence of repetition and training and learning; we have also empha-

sized the importance of suggestion and autosuggestion, of imitation and systematic organization of impulses. Certainly every one of our mental abilities, so far as they are dependent upon activities, can be splendidly developed by regular persistent training and can be badly injured by lack of training and by careless and reckless exceptions and neglect. Moreover all learning of new material, all new knowledge gained by deliberate reading or life experience, must raise the general standing of the mind. Finally we can learn to cover our weaknesses, to substitute one mental function for another, to help out by reasoning where the memory is not sufficient or to help out by good memory where the intellect is weak. Willpower and training may become substitutes for natural emotional interests. In short we can learn to keep house with our resources.

But all this cannot deceive us as to the fundamental fact that the decisive tendencies of our mind are inherited and cannot be fundamentally changed. The man who has no memory for faces may well learn the tricks by which he can find out the name of the man he meets without his friend's noticing that he was not recognized. But neither good-will nor training will furnish him with that memory which he lacks. The man who has a focusing type of attention will never gain an expansive type by merely trying to attend to various things. Whatever there is of expansive tendency in his attention may be somewhat developed by systematic training, but he will remain, after all, a man of the focusing type. If we are unmusical, we may learn to play the piano a little, but we remain unmusical our life long.

There is no harm in this situation. There is no need of everyone's being able to be everything. Society only needs that everyone recognize where his strength and

where his weakness lies and that the life-work shall not be wrecked by a careless ignoring of these individual differences. There is no mental type for which society has not a place where he can do useful work which makes him happy and which serves the world. Nothing is necessary but to discover the capacities and dispositions with which an individual has to make his struggle for existence.

This problem, the greatest which modern mankind has before it, if our life is to be one of social peace and happiness and success, can be answered by psychology only. It must be added, however, as the last word, as it was the first, that it is not sufficient to be satisfied with a kind of pseudo-psychology which is a mixture of popular business talk and scientific gossip. The only psychology which can help is a thorough understanding of the elements and the laws of mental life; and this means a psychology which cannot be absorbed by a superficial nibbling, but only by an earnest, faithful, and sometimes difficult study.

TEST QUESTIONS

1. To what extent are testimonials and certificates useful in determining upon the fitness of an applicant?
2. What two main criticisms would you offer to the self-observational method of testing an applicant?
3. Why is it essential to make tests of the subjective factors in a man's life? What are some of these factors?
4. What would be the purposes and the chances of a commercial psychological laboratory?
5. What simple and useful tests of sensations might be made in selecting a ribbon salesman?
6. For what purposes are memory tests useful?
7. For what purposes are tachistoscopic tests used?
8. What are the chief types of attention tests?

9. If you were planning to train yourself for a speed test in typewriting, would it be useful for you to know your reaction time?

10. Explain some simple and practical reaction time tests.

11. How may associational memory tests be used for determining general intelligence?

12. Suggest a simple experiment for testing an individual's ability to make quick decisions in a complex situation.

13. How may psychological tests be used in selecting a street car motorman? A telephone operator? A salesman?

14. From the standpoint of personal efficiency, have you a better understanding of your own abilities and the methods of using them to advantage as a result of this study?

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